

GERAGHTY & MILLER, INC.

INVESTIGATION OF GROUND-WATER, SOILS AND  
WASTEWATER DISPOSAL SYSTEMS AT THE  
HONEYWELL SIGNAL ANALYSIS CENTER,  
ANNAPOLIS, MARYLAND

FINAL REPORT

JUNE 1988

SUBMITTED BY:

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TABLE OF CONTENTS

	<u>Page</u>
Executive Summary.....	E-1
1.0 Introduction.....	1-1
1.1 Summary of Reconnaissance Investigation.....	1-3
2.0 Principal Findings.....	2-1
3.0 Field Program.....	3-1
3.1 Task 1 -- Initial Stream Sampling of Drinking Water Wells and Stream Samples.....	3-2
3.1.1 Task 1.1 -- Stream Sampling.....	3-6
3.1.2 Task 1.2 -- Municipal Well Sampling....	3-6
3.1.3 Task 1.3 -- Domestic Well Sampling....	3-8
3.1.4 Seep Sampling.....	3-8
3.2 Task 2 -- Detailed Stream Study.....	3-8
3.3 Task 3 -- Dry-Well and Septic Tank/Pit Sampling.....	3-9
3.4 Task 4 -- Waste-Isopropanol Disposal Area Sampling.....	3-10
3.5 Task 5 -- Stream-Side Borings, Monitor Wells..	3-12
3.6 Task 6 -- Hilltop Borings and Monitor Wells...	3-16
3.7 Task 7 -- Second Sampling Event.....	3-18
4.0 Results of Field Program.....	4-1
4.1 Wastewater Disposal Systems.....	4-1
4.2 Dry-Well and Septic Tank/Pit Contents.....	4-10
4.2.1 Dry-Well Sludges.....	4-11
4.2.2 Dry-Well Liquids.....	4-12
4.2.3 Septic Tank/Pit Contents.....	4-13
4.3 Geology/Hydrogeology.....	4-13
4.3.1 Regional Geology/Hydrogeology.....	4-13
4.3.2 Site Geology.....	4-24
4.3.3 Site Hydrogeology.....	4-31
4.3.4 Well Survey.....	4-38

GERAGHTY & MILLER, INC.

TABLE OF CONTENTS (PAGE 2)

	<u>Page</u>
4.4 Ground-Water Quality.....	4-41
4.4.1 Drinking Water Supplies.....	4-41
4.4.2 Monitoring Well Water.....	4-41
4.4.3 Suspended Solids Relationship to Chromium Concentrations.....	4-47
4.5 Surface Water Quality.....	4-49
4.5.1 Stream and Mini-Piezometer Water.....	4-49
4.5.2 Road-Side Ditch Water.....	4-50
4.6 Soil Conditions.....	4-51
4.6.1 Soils Adjacent to Septic Tanks/Pit.....	4-51
4.6.2 Dry-Well Borings.....	4-52
4.6.3 Isopropanol Disposal Area Borings.....	4-53
4.6.4 Screen Interval Soils.....	4-54
4.6.5 Background Soil Borings.....	4-54
5.0 Sorption Study (Geochemical Analysis).....	5-1
5.1 Study Components.....	5-1
5.2 Results.....	5-2
6.0 Conceptual Remedial Measures.....	6-1
7.0 Follow-On Investigations.....	7-1
8.0 References.....	8-1

GERAGHTY & MILLER, INC.

LIST OF FIGURES

	<u>Page</u>
1. General Location Map.....	1-2
2. Reconnaissance Investigation Location of Wells...	1-5
3. Stream and Mini-Piezometer Sampling Locations....	3-7
4. Boring and Monitor Well Locations.....	3-11
5. Disposal System A Components.....	4-5
6. Disposal System B Components.....	4-6
7. Disposal System C Components.....	4-7
8. Disposal System D Components.....	4-8
9. Regional Geologic Cross Section.....	4-14
10. Generalized Surficial Geology of Anne Arundel County, Maryland.....	4-17
11. Regional Water Quality Sampling Locations.....	4-20
12. Regional Water Quality Sampling Locations Insert CE.....	4-21
13. Regional Water Quality Sampling Locations Insert DE.....	4-22
14. Geologic Cross Section A-A'.....	4-25
15. Site Topography.....	4-26
16. Cross-Section A-A' Showing Borehole Geophysics Relationship.....	4-27
17. Borehole Geophysical Logs for Well GM-9.....	4-28
18. Borehole Geophysical Logs for Well GM-11.....	4-29
19. Borehole Geophysical Logs for Well GM-18.....	4-30
20. Water-Table Elevation Contour Map.....	4-34
21. Schematic Flow Net Along Vertical Cross-Section A-A'.....	4-35
22. Location of Water Supply Wells in the Vicinity of the Honeywell Facility.....	4-39

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LIST OF FIGURES (PAGE 2)

	<u>Page</u>
23. Distribution of Trichloroethene in the Uppermost Aquifer.....	4-43
24. Distribution of 1,1,1-Trichloroethane in the Uppermost Aquifer.....	4-44
25. Distribution of 1,1-Dichloroethene in the Uppermost Aquifer.....	4-45
26. Distribution of Tetrachloroethene in the Uppermost Aquifer.....	4-46
27. Suspended Solids Relationship to Chromium Concentrations in Aquia Formation Water Samples.....	4-48
28. Barium Concentrations with Depth in all Borings.....	4-56
29. Chromium Concentrations with Depth in all Borings.....	4-57
30. Sorption Equilibrium Concentrations in Soil and Solutions.....	5-3
31. Langmuir Plot of Sorption Data.....	5-8
32. Ground Water Remedial Measures.....	6-2
33. Sludge/Soil Remedial Measures.....	6-5

GERAGHTY & MILLER, INC.

LIST OF TABLES

	<u>Page</u>
1. Suites of Chemical Analysis.....	3-3
2. Analytical Methods.....	3-4
3. Summary of Sample Type and Chemical Analysis Suites by Task.....	3-5
4. Well Construction Details.....	3-13
5. Wastewater Streams at the Honeywell Signal Analysis Center.....	4-2
6. Characterization of Selected Wastewater Streams..	4-3
7. Stratigraphic, Hydrogeologic and Lithologic Characteristics of Geological Formations in the Annapolis Area.....	4-16
8. Regional Ground-Water Quality Data.....	4-19
9. Results of Analysis on Shelby Tube Samples.....	4-32
10. Summary of Short Duration Pump Test Results.....	4-36
11. Summary of Drinking Water Supply Well Characteristics.....	4-40
12. Chromium Sorption Results.....	5-5

LIST OF PLATES

(Located Behind Appendices)

1. Dry Well and Septic Wastewater Disposal Systems

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LIST OF APPENDICES

<u>Page</u>
A. Analytical Results..... A-1
B. Field Methods, Protocols and Quality Assurance Procedures..... B-1
C. Work Plan/Health and Safety Report..... C-1
D. Sorption Study Report..... D-1
E. Remedial Technologies Screening Report..... E-1
F. Reconnaissance Study Report..... F-1
G. Boring Logs and Well Construction Logs..... G-1
H. Geotechnical Laboratory Certificates..... H-1
I. Short Duration Pump Test Data..... I-1
J. Laboratory Certificates of Analysis..... J-1
K. Photographs of Soil Samples..... K-1

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EXECUTIVE SUMMARY

Geraghty & Miller, Inc. (G&M) was retained by Honeywell, Inc. to perform a comprehensive investigation of ground-water and soil conditions and wastewater disposal systems at the Honeywell Signal Analysis Center (SAC) in Annapolis, Maryland. A 1986 reconnaissance study found six volatile organic compounds (VOCs) in ground water beneath the site. The objectives of the current (1987-1988) investigation were as follows:

- Determine the contents of dry wells, septic tanks, and a septic pit on site.
- Determine the lateral and vertical extent of VOCs in ground water.
- Determine the quality of surface waters near the facility.

A major field program lasting approximately one year was undertaken to complete seven tasks listed below.

- Task 1      Initial sampling of drinking-water wells and surface waters
- Task 2      Detailed stream study
- Task 3      Sampling of dry wells, septic tanks, and adjacent soils
- Task 4      Waste isopropanol disposal area sampling
- Task 5      Stream-side borings and monitoring wells
- Task 6      Hilltop borings and monitoring wells
- Task 7      Full round of water-quality sampling

These tasks were initiated after a final work plan (including a health and safety plan) was approved by the State of Maryland Department of Hazardous and Solid Waste Management Administration (HSWMA) in August of 1987. Twenty-one wells were installed at various depths into the uppermost aquifer and sampled. The contents and adjacent soils of eleven drywells, three septic tanks, and one septic pumping

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pit were sampled and analyzed. Surface waters were sampled and various hydrogeologic parameters were measured.

In addition to the field program, two studies were undertaken to aid in the investigation. One study examined the capacity of sediments below the dry wells to adsorb the chromium present in the wastewaters. A second study provided a screening of remedial technologies appropriate for addressing ground waters with VOCs and dry well DW-9 sludges.

The results of the investigation show that the uppermost aquifer occurs in the Aquia and Brightseat formations and is unconfined. Ground-water flow in this aquifer in the vicinity of the SAC is primarily northeast toward MD Rt. 450. The uppermost aquifer is used as a source of domestic water supply within one mile of the SAC. A confining unit separates the uppermost aquifer from the major underlying water-supply aquifer, the Magothy formation. No drinking-water supplies in the vicinity of the SAC were found to contain VOCs.

Ground waters containing VOCs were found to be limited to the Aquia portion of the uppermost aquifer, that is the upper 20' of the uppermost aquifer. These waters flow from the potential source area near the SAC to a road-side ditch along the south side of MD Rt. 450. During low flows, these ground waters containing VOCs may also be discharging to a tributary stream north of MD Rt. 450.

Twelve unfiltered ground-water samples during the late March 1988 sampling event were also found to contain levels of total chromium, slightly above the drinking-water standard. However, these levels are believed to be a result of sampling procedures and do not represent dissolved concentrations of chromium.

The sludges and liquid found in dry wells and septic tanks/pit contain concentrations of VOCs and metals, with the exception of Dry Well DW-9. Concentrations of VOCs are generally in the low part-per-billion range. Extraction procedure toxicity (EP-TOX) test results for all sludges show metal concentrations below RCRA standards for defining hazardous waste. The sludges in dry well DW-9 were found to contain relatively high concentrations of 12 VOCs. The highest were trichloroethene (up to 19,670 mg/kg), tetrachloroethylene (up to 3,050 mg/kg), 1,1,1-trichloroethane (up to 2,710 mg/kg), and 1,1-dichloroethene (up to 124 mg/kg).

Soil samples taken from borings next to dry wells, septic tanks/pit, and the isopropanol waste-disposal area were found to contain very low concentrations of VOCs and

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acid digestion extractable metals. The VOCs identified are primarily trichloroethene and tetrachloroethene. Concentrations of acid digestion extractable metals in soil samples were found to be similar to those in the background conditions. EP TOX extractions show metal concentrations lower than RCRA standards for defining hazardous waste.

The sorption study indicates that the sediments beneath the dry wells and septic tanks have large capacity for adsorbing chromium. Adsorbed chromium is not likely to be released except by rigorous acid digestion.

The most practical remedial measures for ground water containing VOCs involve recovery, treatment and discharge. Recovery can be accomplished via a subsurface drain or closely spaced recovery wells. Practical treatment options include activated carbon, air stripping, and ultraviolet/hydrogen peroxide technologies. The options for discharge of the treated ground water is limited to nearby surface-water discharge, or to ground-water discharge to the uppermost aquifer.

Post screening remedial technologies for Dry Well DW-9 sludges and bottom soils involve excavation, treatment, and disposal of these materials. Treatment options include drying, mechanical dewatering, solidification/stabilization, and off-site incineration. Disposal of the treated materials include a RCRA landfill or, possibly, on-site placement.

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## 1.0 INTRODUCTION

Geraghty & Miller, Inc. (G&M) was retained by Honeywell, Inc. (Honeywell) to perform a comprehensive investigation of ground water, soil conditions, and wastewater disposal systems at Honeywell's Signal Analysis Center (SAC) in Annapolis, Maryland. A general location map for the Honeywell facility is shown in Figure 1. Honeywell's records indicated that wastewaters from a small plating operation and other sources contained heavy metals and volatile organic compounds (VOCs). These wastewaters were previously discharged in a system of drywells (wastewater characteristics and practices are described in Section 1.1). A G&M reconnaissance investigation in 1986 found that ground waters in the vicinity of the principal discharge Dry Well (DW-9) contained concentrations of up to 2.8 mg/l (ppm) of VOCs (a summary of the reconnaissance investigation is provided in Section 1.1). As a result of these findings, and in cooperation with the State of Maryland, this comprehensive study was conducted.

The principal thesis guiding this investigation was that ground-water containing VOCs in the vicinity of the dry wells moves in the uppermost aquifer to the northeast and discharges to surface waters adjacent to MD Rt. 450. Movement of ground waters containing VOCs downward through confining units into the lower aquifer was considered unlikely. The investigation was designed, however, to determine the merit of this latter assumption.

Generally, the investigations involved a comprehensive characterization of site conditions (i.e., geology, soils and hydrogeology and potential sources of the VOCs found in the ground water). Soil borings were inspected through the full thickness of the uppermost aquifer. Monitoring wells and piezometers were installed to allow for vertical and lateral

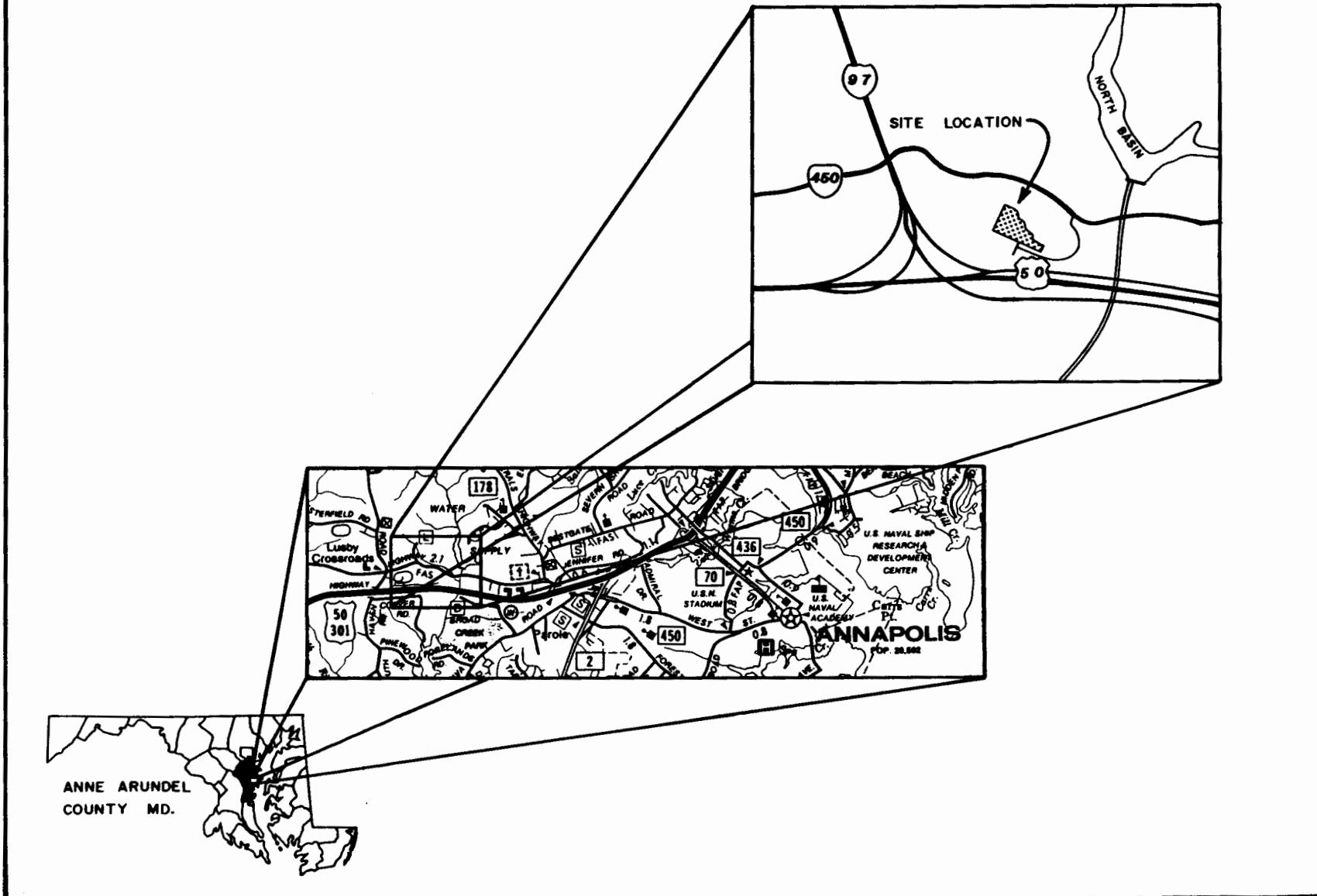


Figure 1. General Location Map

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examination of ground-water conditions. Soils adjacent to the septic tanks and dry wells were sampled and analyzed. The contents of the dry wells were sampled and analyzed. Finally, after all the data were analyzed, conceptual remedial technologies were screened and alternatives discussed.

The objectives of the comprehensive investigation were to:

- Locate and determine the contents of all 11 dry wells, sewage pumping pit and 3 septic tanks at the Signal Analysis Center.
- Determine the lateral and vertical extent of VOCs and metals in ground water and soils.
- Determine the water quality of surface waters adjacent and downgradient from the Signal Analysis Center. These surface waters were likely to be receiving the discharge of ground waters containing VOCs.

A draft work plan was submitted to the State of Maryland in March 1987. After receiving and responding to State of Maryland comments, a final work plan was released in July 1987 (See Appendix C).

### 1.1 Summary of Reconnaissance Investigation

In the fall of 1986, G&M performed a reconnaissance investigation of ground-water conditions at the Honeywell Signal Analysis Center. The principal activities of this investigation were to construct monitoring wells, sample waters of the uppermost aquifer, sample Dry Well DW-9 sludges for EP Toxicity Tests for lead and chromium, and to determine if an overflow dry well was present. A copy of the report is found in Appendix F.

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Five monitoring wells were placed as shown in Figure 2 in the vicinity of Dry Well DW-9. These monitoring wells, GM-1, GM-2, GM-3, GM-4, and GM-5, have been incorporated into the comprehensive investigation. Principal findings of the reconnaissance investigation are listed below:

1. Ground waters of the uppermost aquifer were found to contain up to 2.8 parts-per-million concentrations of chlorinated volatile organic compounds, primarily trichloroethene, 1,1,1-trichloroethane and tetrachloroethene. Other chlorinated organic compounds found at less than a part-per-million concentrations include: 1,1-dichloroethene, 1,2-trans-dichloroethene, and 1,1 dichloroethane. Chromium (total and hexavalent) and lead, were generally at concentrations below detection limits.
2. Ground water in the vicinity of Dry Well DW-9 appears to be moving northeast toward an unnamed, perennial, tributary of Broad Creek.
3. The leachate (EP-Toxicity test) from sediment samples taken from Dry Well DW-9 contained very low levels of chromium (total: 0.1 to 0.4 mg/l) and lead (0.1 to 0.2 mg/l).
4. No overflow pipe was encountered within three feet of the cap of Dry Well DW-9. The presence of a separate overflow dry well is, therefore, denied.

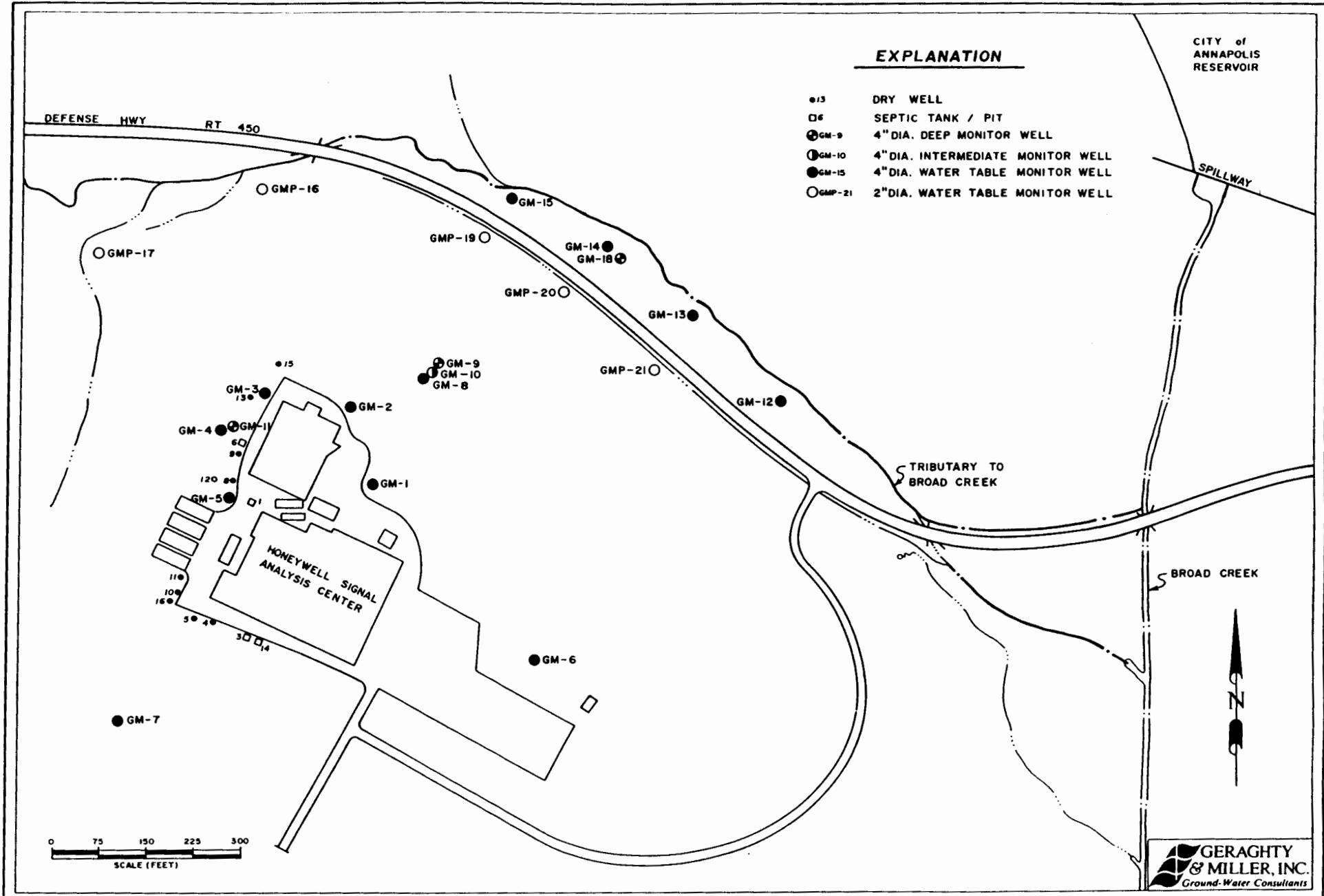


Figure 2. Reconnaissance Investigation Location of Wells

## 2.0 PRINCIPAL FINDINGS

- Site geology is consistent with regional information. The surficial geologic unit is the Aquia Formation, although traces of Marlboro Clay are evident at a few hilltop locations. Beneath the Aquia is a sequence of other Coastal Plain sedimentary units, including the Brightseat, Monmouth/Matawan, Magothy, Patapsco, and Patuxent Formations.
  - = The uppermost aquifer occurs in the Aquia and Brightseat Formations and is unconfined. Ground-water flow in this aquifer in the SAC vicinity is primarily northeast.
  - = A confining unit, the Monmouth/Matawan Formation, separates the uppermost aquifer from the underlying Magothy Formation. The silty clay textured confining unit is approximately 40 to 60 feet in thickness and has a measured vertical hydraulic conductivity in the range of  $1.6 \times 10^{-5}$  cm/sec to  $1.4 \times 10^{-7}$ .
- Municipal and other drinking water sources (i.e., wells) within one-half mile of the Honeywell SAC were found to be free of volatile organic compounds (VOCs). The domestic wells are screened in the uppermost aquifer. Public water-supply wells for the City of Annapolis are screened in the deeper, confined aquifers, the Magothy and Patapsco Formations. Anne Arundel County public supply system wells within a mile of the SAC are screened only in the Patapsco Formation.

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- Ground water containing VOCs has migrated northeast from the SAC in the uppermost aquifer and discharges to surface water bodies in the vicinity of Md. Rt. 450. The principal discharge area during the wet season is a ditch along the southern right-of-way for Md. Rt. 450. VOCs were also detected in the tributary of Broad Creek that flows along the north side of Md. Rt. 450.
- Twelve unfiltered ground-water samples were found to contain chromium (total) concentrations above the drinking water standard. An evaluation of the relationship between chromium levels and suspended solids concentrations indicates that the chromium concentrations are due to sampling procedures and are not representative of true ground-water quality.
- Nine of the dry wells were found to contain sludges (DW-5, DW-7, DW-8, DW-9, DW-10, DW-11, DW-12, DW-13, and DW-16) and seven of the drywells were found to contain liquid sufficient to sample (DW-4, DW-8, DW-10, DW-11, DW-13, DW-15, and DW-16).
  - = Dry-well sludges were found to contain varying concentrations of VOCs, generally in the low parts-per-billion range, with the exception of sludges in Dry Well DW-9.
  - = Sludges in Dry Well DW-9 were found to contain concentrations of 12 VOCs. The highest were trichloroethene (up to 19,670 mg/Kg), tetrachloroethene (up to 3,050 mg/Kg), 1,1,1, trichloroethane (up to 2,710 mg/Kg) and 1,1 dichloroethene (up to 124 mg/Kg).

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- = Extraction Procedure Toxicity (EP Tox) results from all dry-well sludges show metal concentrations lower than RCRA standards defining hazardous waste. Metals included arsenic, barium, cadmium (total), chromium (total), mercury, lead, selenium and silver.
- = Dry-well liquids contained few VOCs. VOCs were not detected in liquids from Dry Wells DW-10 and DW-11. Liquids in Dry Wells DW-4, DW-8 and DW-16 contained 30 to 45 ug/L of toluene. Liquids in Dry Wells DW-13 and DW-15 contained low concentrations (2 to 92 ug/L) of 4 VOCs: trichloroethene, tetrachloroethene, 1,1,1-trichloroethane and 1,1-dichloroethane (methylene chloride and chloroform were also found in liquids from No. 15 at detection limits, 2 ug/L).
- = Dry-well liquids were found to contain concentrations of several metals at or slightly above the Federal drinking water standards. Dry Well DW-13 liquid contained the following: barium (1.5 mg/L), chromium (0.76 mg/L) and lead (0.20 mg/L).
- The septic tanks/pit contained liquids and septage. Liquid samples from tanks ST-1, ST-3 and pit ST-14 contained concentrations of toluene ranging between 25 and 200 ug/L. Liquids from tank ST-6 contained concentrations of 1,1,1-trichloroethane, 1,1-dichlorothane and tetrachloroethene. Metals in the liquids were at or below Federal drinking water standards. Septage-sludge could not be sampled

during the investigation due to insufficient volume.

- Soil samples (taken in the unsaturated zone) from borings next to dry wells were found to contain concentrations of VOCs and acid digestion extractable metals.
  - = Concentrations of VOCs (e.g., <500 ug/kg) were detected in selected samples from eight dry-well borings (DWB-5, DWB-7, DWB-8, DWB-9U (upgradient), DWB-9D (downgradient), DWB-10, DWB-12 and DWB-13) and four septic tank borings (STB-1I (inlet), STB-1O (outlet), STB-6I (inlet) and STB-6O (outlet)). VOCs detected were primarily trichloroethene and tetrachloroethene.
  - = Concentrations of acid digestion extractable metals in soil samples from borings next to dry wells and septic tanks show similar patterns to background conditions. Barium levels were highest in the upper 25 feet, except for the borings adjacent to Dry Wells DW-7 and DW-15 where concentrations above 100 mg/kg were found at depths exceeding 55 feet. Chromium concentrations generally peaked (168 mg/kg) at depths between 35 and 65 feet from ground surface (90 to 60 feet msl). This pattern was most pronounced in the borings next to Dry Well DW-9. Hexavalent chromium was detected at low concentrations, 0.5 to 2.3 mg/kg, in soil samples next to Dry Well DW-9 at depths of 30 to 65 feet from ground surface, but not in deeper samples. Lead

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concentrations did not significantly exceed background levels except in two soil samples, one each in borings next to Dry Well DW-8 and Dry Well DW-9 (downgradient boring). Other priority pollutant metals not mentioned above were below detection limits.

- = All EP TOX extractions from soil samples taken from borings adjacent to dry wells and septic tanks show metal concentrations lower than RCRA standards defining hazardous waste.
- Soil samples from borings in the isopropanol disposal area were found to contain concentrations of VOCs and acid digestion extractable metals.
  - = Low parts-per-billion concentrations of VOCs detected included trichloroethene, tetrachloroethene, 1,1,1-trichloroethane, and 1,1,2-trichloropropene.
  - = Acid digestion extractable metals found in soils from the isopropanol area included: arsenic, barium, chromium, lead, mercury, copper, nickel and zinc. EP Tox extractions from these soil samples show constituent concentrations lower than RCRA standards defining hazardous waste.
- Background soil samples from the Aquia Formation show varying concentrations of total barium (up to 210 ppm), chromium (up to 135 ppm), copper (up to 8 ppm), nickel (up to 7 ppm), lead (up to 11 ppm), selenium (up to 3.2 ppm), and zinc (up to 65 ppm). Barium is concentrated in the upper 10 feet of

sediments on the hilltop with concentrations as high as 210 mg/kg. The highest natural chromium levels in soils (up to 135 mg/kg) are in the depth range of 35 to 55 feet from ground surface. Average chromium concentrations were 77 mg/kg). Copper and selenium concentrations are less than 10 mg/kg and appear to be present only in the upper 10 feet of sediments. Lead concentrations average 7 mg/kg with a narrow range of 4 to 11 mg/kg. Zinc concentrations average approximately 20 mg/kg and appear to increase with depth.

- A sorption study of Aquia sediments found that these sediments have a very high capacity to sorb chromium. Once sorbed, the chromium is not readily released except by rigorous acid digestion.
- Conceptual remedial measures focus on ground water and Dry Well DW-9 contents.
  - = Post screening ground-water remedial measures encompass ground-water recovery, treatment, and discharge. Recovery is most practical via a subsurface drain. A network of recovery wells may also be feasible. Treatment options include activated carbon, air stripping and ultraviolet/hydrogen peroxide technologies. Discharge options of treated ground water include surface discharge to Broad Creek or ground-water discharge to the uppermost aquifer at an upgradient location via injection/dry wells.

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- = Remedial measures for Dry Well DW-9 sludges and bottom soils are focused on removal, treatment and disposal. The extent and amount of materials to be excavated will be determined. Treatment options include drying, mechanical dewatering, solidification/stabilization and off-site incineration. Disposal options include a RCRA Landfill or on-site placement.

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3.0 FIELD PROGRAM

The field program at the Honeywell Signal Analysis Center (SAC) consisted of the seven tasks described in this chapter. These tasks conformed to the July 1987 work plan. The seven tasks were as follows:

- Task 1 -- Initial Sampling: Drinking Water Wells and Stream Stations
- Task 2 -- Detailed Stream Study
- Task 3 -- Septic Dry Well/Tank Sampling & Soil Borings
- Task 4 -- Waste Isopropanol Disposal Area Sampling
- Task 5 -- Stream-Side Borings and Monitor Wells (including hillside wells)
- Task 6 -- Hilltop Borings and Monitor Wells
- Task 7 -- Second Sampling Event (including road ditch).

Several additional activities were incorporated during the field program to better meet project objectives. Added activities were as follows:

- Task 1 -- Hillside seep and surface waters in ravine leading to MD Rt. 450 in vicinity of GMP-20 were sampled.
- Task 2 -- Mini-piezometer transects were conducted across the stream in order to pinpoint ground-water discharge of VOC containing waters.
- Task 3 -- Sludge samples and approximately 10 percent of the dry-well/septic boring soil samples were analyzed for EP-TOX extractable metals (Suite C).
- Task 4 -- Background soil samples were collected at two locations. These samples were analyzed for Suite C metals. In addition, selected soil

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samples were analyzed for EP TOX extractable metals (Suite C).

Task 5 -- Four additional wells were installed along the steep slopes and other difficult-to-access locations using a hand auger. The deep boring GM-18 was geophysically logged prior to well construction. Single well, short duration, pump tests were also conducted at four shallow well locations.

Task 6 -- Background soil samples from boreholes GMB-6 and GMB-7 were analyzed for Suite C metals.

Task 7 -- Selected replicate ground-water samples were field filtered for comparison purposes. Surface-water samples were taken from the road ditch along Rt. 450.

Chapter 3.0 subsections describe each task as performed. Protocols for routine activities (e.g., well sampling or construction) that are repeated between tasks are described in an appendix or references.

Chemical analyses of soil, sludge, and water are grouped into five suites listed in Table 1. Analytical methods are listed in Table 2. Table 3 summarizes the types of samples collected for each task and the relevant suite of analysis.

3.1 Task 1 -- Initial Sampling of Drinking Water Wells and Stream Stations.

This task provided information on ground-water quality associated with drinking-water supplies in the vicinity of the Signal Analysis Center and surface-water quality in the stream northeast of the site. In addition, a seep along MD Rt. 450 was sampled.

## SUITES OF CHEMICAL ANALYSIS

SUITE	PARAMETER TO BE TESTED
Suite A	Chlorinated Volatile Organic Compounds, pH, Specific Conductance, Total Dissolved Solids
Suite B	Suite A plus Major Cations and Anions (Chloride, Sulfate, Alkalinity, Nitrate, Sodium, Magnesium, Calcium, Potassium)
Suite C	Metals (Arsenic, Barium, Cadmium, Copper, Total Chromium, Hexavalent Chromium, Lead, Mercury, Nickel, Selenium, Silver, Zinc)
Suite D	Total Cyanide, Priority Pollutant Organics (Volatile Compounds, Base/Neutral Extractable Compounds, Acid Extractable Compounds, and Pesticide/PCB's)
Suite E	Soil pH or Corrosivity

TABLE 2  
ANALYTICAL METHODS

<u>Indicator Parameters</u>	<u>Method</u>	<u>Reference</u>
pH	150.1	A
Specific Conductance	120.1	A
Total Dissolved Solids	160.1	A
<u>Drinking-Water Metals</u>		
Arsenic	206.2	A
Barium	208.1	A
Cadmium	213.1	A
Chromium (Total)	218.1	A
Chromium (Hexavalent)	218.4	A
Mercury	245.1	A
Selenium	270.2	A
Silver	272.1	A
Lead	239.1	A
<u>Other Parameters</u>		
Chloride	325.3	A
Sulfate	375.3	A
Alkalinity	310.1	A
Nitrate	353.2	A
Sodium	273.1	A
Magnesium	242.1	A
Calcium	215.1	A
Potassium	258.1	A
Cyanide (Total)	335.3	A
<u>Organic Analysis</u>		
Chlorinated Volatile Organics	601	B
Volatile Organics	624 (601 and 602)	B
Base/Neutral and Acid Extractable Organics	625	B
Pesticide PCBs	608	B
<u>Additional Soil Methods</u>		
Digestion	3010	C
EP Toxicity Extraction		C
Volatile Organics	8240	C
Base/Neutral and Acid Extractable Organics	8250	C
Pesticide PCBs	8080	C
Cyanide (Total)	9010	C

A - EPA 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes," March 1979, Revised March 1983.

B - 40 CFR Part 136 Federal Register, Vol. 49, No. 209.

C - SW-846, "Test Methods for Evaluating Solid Waste," July 1982.

TABLE 3.  
SUMMARY OF SAMPLE TYPE AND CHEMICAL ANALYSIS SUITES BY TASK

Sample Type	Suite A	Suite B	Suite C	Suite D	Suite E
<b><u>Water Analysis</u></b>					
Task 1: Stream Samples	X		X		
Water-Supply Wells	X		X		
Task 2: Stream Samples Mini-Piezometers	X	X	X		
Task 3: Dry-Well/Septic Tank/Pit Liquid (if present)			X	X	
Dry-Well/Septic Tank/Pit Sediment			X	X	
Soil samples from Borings Adjacent to Drywells and Septic Tanks/Pit			X	X	X
Task 4: Disposal Area Samples			X	X	X
Task 5: Stream-side Monitor Wells	X		X		
Soil Sample from Screened Interval	X		X		
Task 6: Hilltop Monitor Wells	X		X		
Soil Sample from Screened Interval	X		X		
Task 7: Stream-Side Monitor Wells	X		X		
Hilltop Monitor Wells	X		X		
Existing Monitor Wells (GM-1 through GM-5)	X		X		
Landfill Well OW-1	X		X		
County Water Wells	X		X		

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## 3.1.1 Task 1.1 -- Stream Sampling

Nine stream-sampling locations were established and sampled. The stream sampling locations are depicted in Figure 3. The uppermost location was upstream from the stream segment most likely affected by ground-water discharge potentially containing organic compounds and served as a background stream water-quality sample. The furthest downstream sampling location was located just upstream from the Md. Rt. 50 culvert. Six other sampling locations were located between these two end locations at accessible points along the stream and its tributaries. One sample (S-2) was also collected from the base of the spillway at the Annapolis Water Works Reservoir. Two small tributaries on either side of the stream were sampled. The tributary to the northeast (S-6) appears to contain runoff from a sediment basin at the Annapolis Landfill. Temporary monuments were used to mark each station. Table 3 indicates the suites of analyses performed on each sample. Sampling protocols are discussed in Appendix B.

## 3.1.2 Task 1.2 -- Municipal Well Sampling

The six City of Annapolis water-supply wells and one of the three county wells, all within a radius of one mile of the Signal Analysis Center, were sampled. Two of the county wells could not be sampled due to 1) lack of sampling port and 2) well maintenance. Table 3 indicates the suites of analyses performed on each sample. Sampling protocol is outlined in Appendix B.

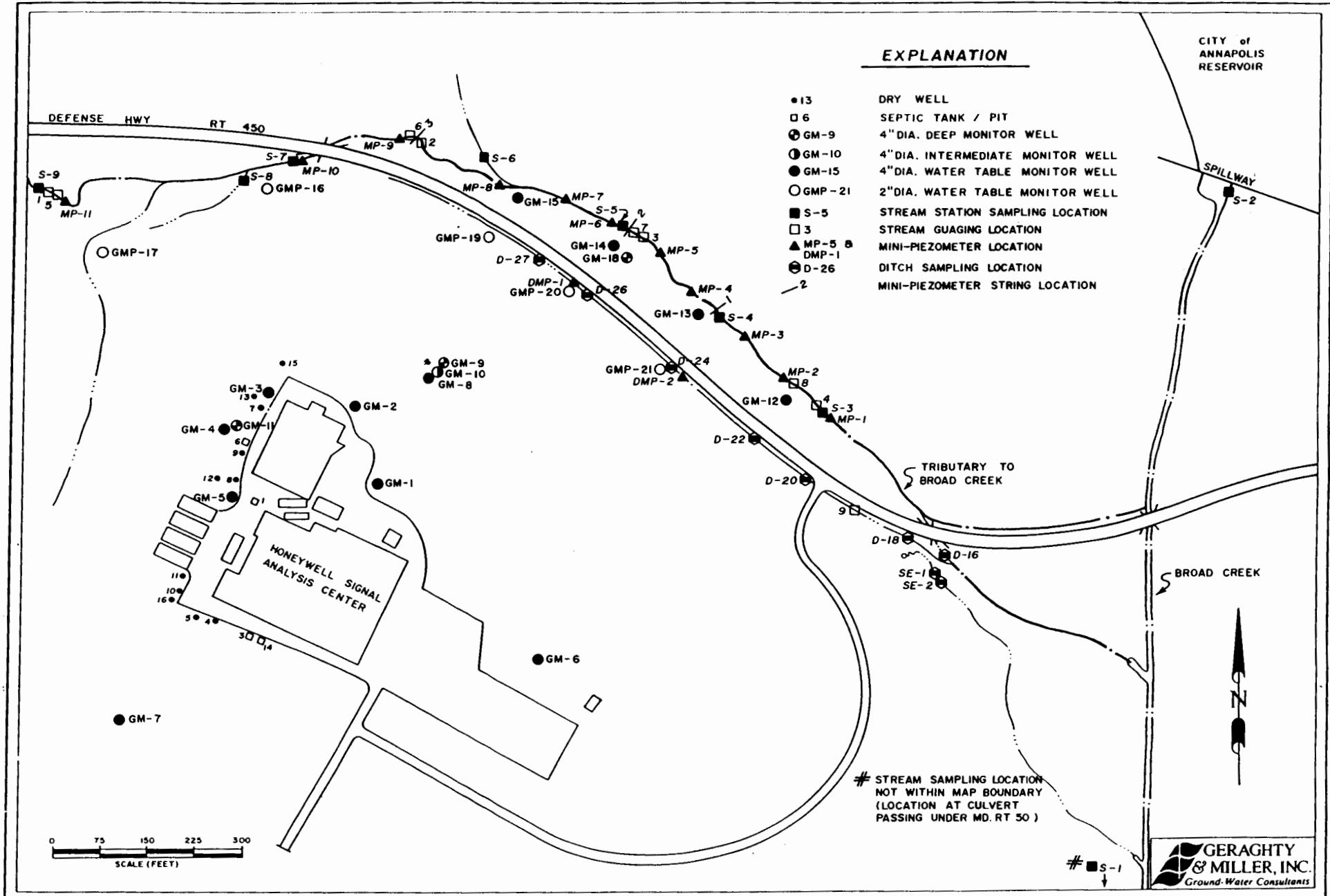


Figure 3. Stream and Mini-Piezometer Sampling Locations

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### 3.1.3 Task 1.3 -- Domestic Well Sampling

G&M identified domestic water supply wells within one-half mile of the SAC and supplied this information to the State of Maryland. Sampling and subsequent analyses of these wells were conducted under the purview of the State of Maryland Department of Environment and the Anne Arundel County Health Department (with G&M representation).

### 3.1.4 Seep Sampling

A road-cut seep along MD Rt. 450 in the vicinity of GMP-20 was sampled for Suite A VOCs. The seep was associated with an intermittent surface drainage in the bottom of a ravine. Waters in the surface drainage were also sampled. Suite A VOCs were analyzed on both samples.

## 3.2 Task 2 -- Detailed Stream Study

In the late summer/early fall of 1987 a detailed stream study was undertaken to determine if ground waters from the Signal Analysis Center were discharging into a small stream northeast of the facility. Additional stream work was conducted in January, 1988.

The nine stream sampling locations, established in Task 1, were resampled in September 1987 to confirm the initial results. Stream samples were collected to determine if, and to what extent, ground waters are discharging to the small stream northeast of the Signal Analysis Center (sampling locations are shown in Figure 3). Table 3 indicates the suites of analyses performed on each sample. In addition, specific conductance, pH, and temperature were measured in the field. Stream sampling protocol is discussed in Appendix B.

Stream flow rate was measured using a small flume at several locations along the study segment (see Figure 3). Use of the flume is discussed in Appendix B.

Mini-piezometers were installed into the stream bed at various locations between upstream and downstream to finalize the stream study tasks. Individual mini-piezometers and strings of mini-piezometers were employed on separate occasions.

Initially, eleven individual piezometers were installed, head measurements taken, and sampled. Follow-up mini-piezometer work included three strings (transects) of five mini-piezometers placed in a line across the width of the stream at locations depicted in Figure 3. Suite A analyses were performed on water samples. Sample protocol and mini-piezometer installation are described in Appendix B.

### 3.3 Task 3 -- Dry-Well and Septic Tank/Pit Sampling

Eleven known dry wells and four septic tank pits exist on the Honeywell site according to Honeywell records and G&M findings (see Section 1.1). Activities under this task were to 1) accurately locate each dry well/tank, 2) determine critical dry well/tank dimensions (total depth, thickness of perched liquid and thickness of sludge material), 3) sample liquid and sludge material, and 4) collect soil samples from boreholes next to each dry well and tank. Sludge and liquid samples were analyzed for Suites C and D. Soil samples were analyzed for Suite C, D, and E parameters.

Dry wells and tanks were located with hand tools and a backhoe. Access ports were uncovered and PVC riser pipes were installed. Elevations of dry well/tank tops were

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surveyed. Procedures and protocols used to sound and sample the dry wells and septic tanks are discussed in Appendix B.

In addition to sampling material inside the wells, one boring was drilled and soil samples collected continuously next to each of ten dry wells. Two borings were drilled proximal to Dry Well DW-9, and two borings were drilled near each of four inlet and outlet pipes for septic tanks. Note that one borehole served as outlet for septic pumping pit ST-14 and inlet for septic tank ST-3.

Soil samples were collected with split-spoon samplers. All spoon samples were photographed (Appendix K) before soil removal and archived in glass containers. Boreholes were drilled a minimum 10 to 20 feet below each dry well/tank, except for borings adjacent to DW-9 which extended to the water table.

Soil samples for lab analysis were collected at five-foot intervals and analyzed for Suite C, D, and E parameters. Head space gas, in sample intervals not sent for lab analyses, was screened using a Photovac TIP or Foxboro OVA for VOCs. Sample core logs are found in Appendix G. A detailed discussion of sample collection and handling procedure is provided in Appendix B.

3.4 Task 4 -- Waste-Isopropanol Disposal Area Sampling

A small area along the north side of the production building was known to be used for disposal of waste isopropanol (see Figure 4). This area was sampled to determine soil conditions. Soil borings were made at two locations using a hand auger and post-hole digger. Samples were collected at three discrete intervals in each borehole

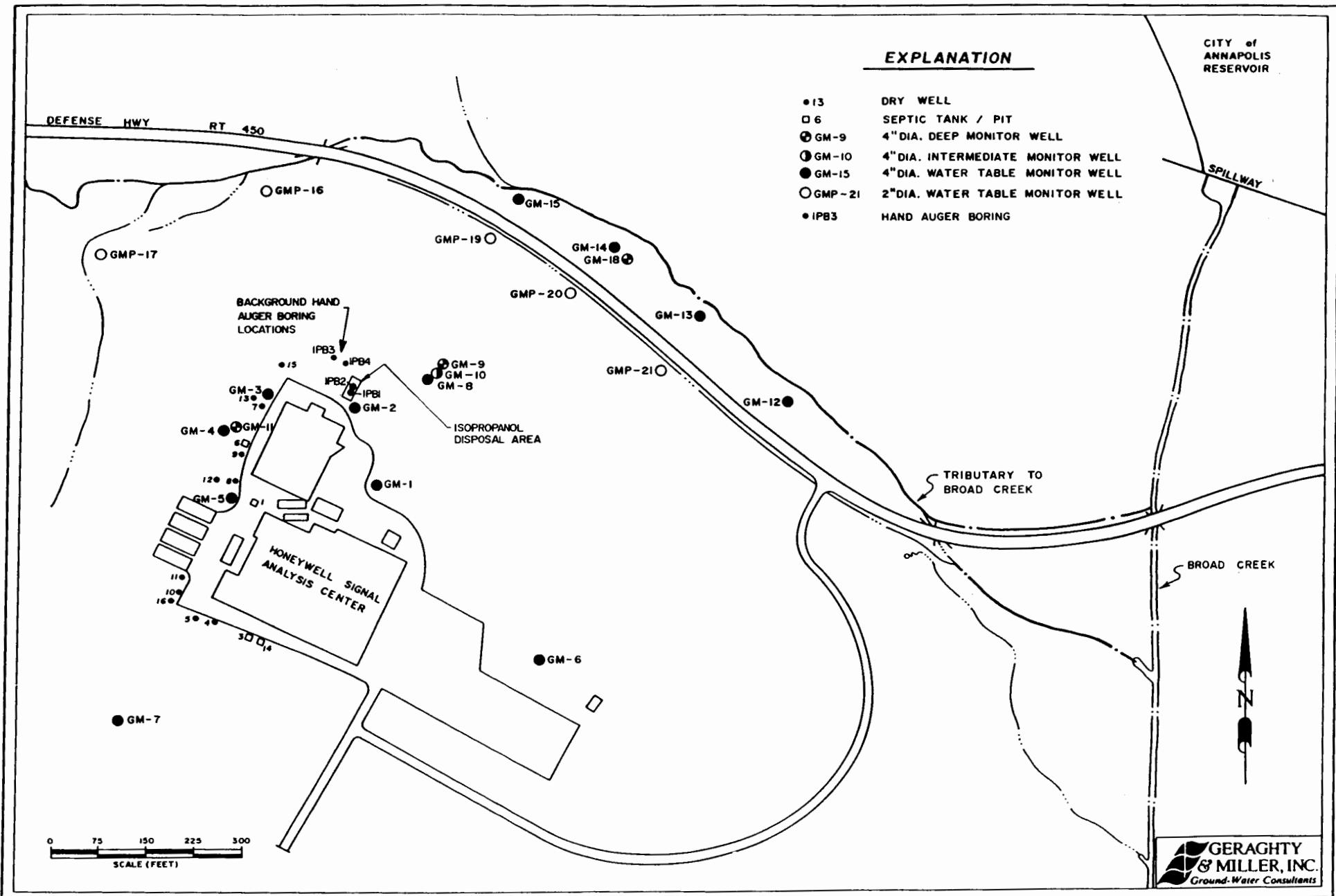


Figure 4. Boring and Monitor Well Locations

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(0-6", 18-24", and 42-48" from ground surface). Soils in the two boreholes were analyzed for the parameters in Suites C, D, and E. Sampling procedures are explained in Appendix B.

At a later date, a second background area close to the isopropanol disposal area was sampled. Samples were collected from two hand auger borings at discrete intervals (0-6", 18-24", 42-48", 66-72" and 114-120"). These soil samples were analyzed for Suite C metals only.

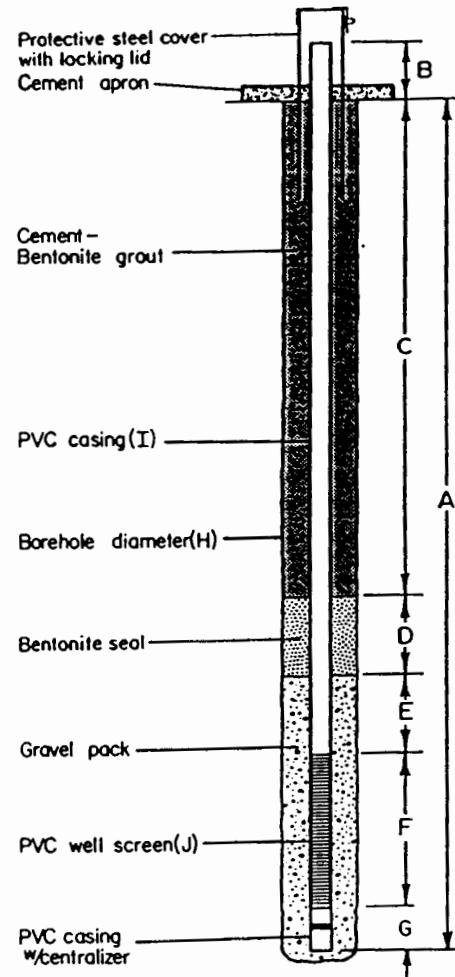
3.5 Task 5 -- Stream-Side Borings, Monitor Wells

G&M inspected the installation of ten permanent wells along the stream at locations shown in Figure 4. Five borings were drilled with a drilling rig and converted to 4" wells (GM series) while five were drilled by hand and converted to 2" wells (GMP series). Nine of the wells are less than 20 feet in total depth. One well extends to the top of the confining unit overlying and separating the uppermost aquifer (i.e., Aquia and Brightseat formations) from the Magothy Aquifer. Well construction details are presented in Table 4.

Numbers and types of monitor wells installed along Md. Rt. 450 and the stream can be categorized as follows:

- one deep, 4-inch-diameter stream-side monitor well screened above the first confining unit,
- four, 4-inch-diameter stream-side monitor wells, screened in the alluvium,
- and five, 2-inch-diameter wells placed on the hillside adjacent to Md. Rt. 450 and adjacent to the stream at locations not accessible with a drilling rig.

TABLE 4. WELL CONSTRUCTION DETAILS



	Well ID	A	B	C	D	E	F	G	H	I	J	FORMATION SCREENED	ELEVATION (TOC)	ELEVATION (GROUND LEVEL)
3-13	GM-1	106	1	0-71	71-74	74-86	86-106	N/A	10	4	20/10	AQUIA	121.38	120.64
	GM-2	115	1	0-77	77-80	80-95	95-115	N/A	10	4	10	AQUIA	121.87	121.03
	GM-3	106	2	0-72	72-74	74-86	86-106	N/A	10	4	10	AQUIA	124.72	122.69
	GM-4	99	1.5	0-70	70-72	72-79	79-99	N/A	10	4	10	AQUIA	118.06	116.62
	GM-5	113	1	0-78	78-80	80-93	93-113	N/A	10	4	20/10	AQUIA	128.70	127.35
	GM-6	108	2	0-77	77-80	80-88	88-108	N/A	9	4	10	AQUIA	125.43	123.08
	GM-7	88	2.5	0-48	48-50	50-63**	63-88	N/A	9	4	20	AQUIA	106.00	103.75
	GM-8	96	2	0-63	63-66	66-71	71-96	N/A	11	4	20	AQUIA	105.79	103.90
	GM-9	142.5	2	0-117	117-120	120-126	126-141	141-142.5	11	4	20	BRIGHTSEAT	105.01	103.90
	GM-10	118	2	0-95	95-98	98-103	103-118	N/A	11	4	20	AQUIA/BRIGHTSEAT	105.44	103.90
	GM-11	158	2	0-133	133-136	136-141	141-156	156-158	11	4	20	BRIGHTSEAT	119.51	117.82
	GM-12	15.5	2	0-3.5	3.5-4.5	4.5-5.5	5.5-15.5	N/A	6	4	10	ALLUVIUM	17.70	15.8
	GM-13	15.5	2	0-3.3	3.3-4.5	4.5-5.5	5.5-15.5	N/A	6	4	10	ALLUVIUM	19.32	17.17
	GM-14	15	2	0-2.5	2.5-3.5	3.5-5	5-15	N/A	6	4	10	ALLUVIUM	20.18	18.01
	GM-15	15	2	0-3	3-4	4-5	5-15	N/A	6	4	10	ALLUVIUM	21.60	20.08
	GMP-16	15	2	0-3*	3-4	4-5	5-15	N/A	4	2	10	AQUIA	25.05	23.13
	GMP-17	18	2	0-6*	6-7	7-8	8-18	N/A	4	2	10	AQUIA	34.17	33.18
	GMP-18	61.5	2	0-27.5	27.5-34.5	34.5-41.5	41.5-61.5	N/A	9	4	10	AQUIA	18.07	(~16.07)
	GMP-19	14	1	0-3*	3-3.5	3.5-4	4-14	N/A	4	2	20	AQUIA	25.85	24.87
	GMP-20	14	1	0-3*	3-5.5	5.5-7	7-14	N/A	4	2	10	AQUIA	25.49	24.65
	GMP-21	14.5	1	0-2*	2-4	4-5	5-14.5	N/A	4	2	20	AQUIA	24.21	23.10

A. Total Well Depth (BGL)

B. Stick up above ground level

C. Grouted interval

D. Bentonite pellet seal (BGL)

E. Gravel pack above screen (BGL)

F. Screened interval (BGL)

G. Casing and centralizer interval (BGL)

H. Borehole Diameter (inches)

I. Casing and screen diameter

J. Screen slot size

\* Dry Bentonite Powder &amp; Cuttings

\*\* From 50-56' -- Natural Formation Material

(BGL) = Below Ground Level

(TOC) = Top of Casing

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The July 1987 work plan called for six, four-inch diameter wells in the vicinity of the stream. However, due to drill site access difficulties, one four-inch well was deleted. It was replaced by two, two-inch diameter wells. An additional three hillside wells were installed to help further define conditions in the vicinity of the Md. Rt. 450 drainage ditch. These changes in the scope of work were verbally approved by the State of Maryland Department of Environment.

A drilling program was initiated with the monitor-well installation program at each of five locations, GM-12, GM-13, GM-14, GM-15 and GM-18. Note that the boring logs are labeled GMB-12, GMB-13, GMB-14, GMB-15, and GMB-18. Boreholes were drilled with standard eight-inch O-D hollow-stem augers and sampled continuously. Soil samples were collected with standard two-inch diameter split spoons ahead of the lead auger flight. A G&M representative field classified soil samples and archived the samples in glass containers. Blow counts, recovery, depth and soil description information were logged. Soil sample container head space VOCs were screened with a Photovac TIP or a Foxboro OVA; these measurements were also logged. Split spoons were rinsed between each sample with municipal water from a fire hydrant.

Once the hollow-stem auger borings were completed, the augers were withdrawn and formation material was allowed to collapse into the borehole. Each borehole was sealed at or near the surface with bentonite pellets and/or powder. The deep boring (GMB-18) was abandoned by placing a bentonite slurry with pellets in the portion of the borehole drilled into the Matawan-Monmouth Formations. Formation materials were allowed to collapse into the borehole above this level.

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Monitor wells were installed at GM-12, GM-13, GM-14, and GM-15 using the driven casing method. Six-inch steel casing was driven to the target depth of well bottom. Clean tap water was used to flush sediments out of the casing. Once cleaned out, the well was lowered into the steel casing. Wells were constructed of four-inch diameter Schedule 40 flush-joint casing and screen. A gravel pack was placed around the well screen. Gravel was installed and casing was pulled in approximately one-foot increments until the gravel pack and casing were above the screened interval. A bentonite pellet seal was then placed. Well construction was completed with a bentonite/cement grout mix placed overtop the pellets. A locking steel protective cover was placed over the well and a concrete apron formed around the well.

While driving casing, one sample was collected from each of three well screened intervals for lab analysis. Samples were collected using a two-inch or three-inch-diameter split spoon cleaned and rinsed with distilled water. The screen interval soil samples were analyzed for Suite A and C parameters. The screened interval sample for one well (GM-12) was taken from its initial hollow-stem auger boring in the same manner and tested for the same parameters.

The deeper stream-side well (GM-18) was constructed in a mud rotary borehole next to the abandoned hollow-stem test boring. A screened interval sample was taken with a split spoon sampler and analyzed for suites A and C.

The remaining five wells along Route 450 were constructed in borings drilled with a four-inch diameter closed-bucket hand auger. The auger was thoroughly washed with micro soap solution and rinsed with distilled water between borings. When possible, the auger was steam cleaned

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in lieu of washing. Soil descriptions were logged continuously in the hand-auger borehole. For two stream side borings/wells (GMP-16 and GMP-17), soil samples were collected representing the screened interval and subsequently analyzed for Suite A and C parameters. Archived samples were screened with a Photovac TIP or a Foxboro OVA. At the three Hillside borings/wells (GMP-19, GMP-20 and GMP-21) no soil samples were collected or archived.

All five wells installed in the four-inch hand-auger borings were constructed of two-inch diameter Schedule 40 PVC. Coupled joints were used for some wells, while flush-joints were used in others, depending on material availability. For wells with coupled joints -- stainless steel screws were used (no cementing compounds were permitted). Wells were constructed with gravel packs, bentonite pellet seals were placed above the screen packs, and the remaining annulus grouted to the surface. Steel locking protective covers were installed along with a small apron around the well head.

Well construction details are presented in Table 4. Wells were developed according to procedures described in Appendix B.

3.6 Task 6 -- Hilltop Borings and Monitor Wells

Six monitor wells were installed at the locations depicted in Figure 4 on the hilltop area of the SAC. Three of the wells were constructed approximately 10 to 15 feet into the saturated zone (GM-6, GM-7, and GM-8). Two of the remaining wells were constructed to the bottom of the uppermost aquifer (GM-9 and GM-11). An additional well was

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installed to an intermediate depth (GM-10). The well construction details are presented in Table 4.

Work performed on the hilltop at Honeywell under Task 6 included three hollow-stem auger borings and six mud rotary boreholes. The latter were converted to monitor wells. Soil samples were screened in the field for volatile organic compounds using either a Photovac TIP or a Foxboro OVA. The two deeper borings were geophysically logged prior to well construction. Top of well casing and ground surface elevations were surveyed after completion.

Hollow-stem auger borings were drilled in three locations, GM-6, GM-7, and GM-8, to determine depth to water, soil characteristics, and collect background soil samples. Note, these borings are labelled GMB-6, GMB-7 and GMB-8 on boring logs. Borings were drilled with standard hollow-stem augers and sampled at five-foot intervals. (Hollow-stem augers have a depth limitation of approximately 100'.) Five background soil samples were collected for lab analysis at ten foot intervals in each boring at GM-6 and GM-7 locations. These soil samples were analyzed for Suite C parameters (metals). Three Shelby tube samples were collected in the Aquia formations materials. Analyses performed included porosity, permeability, and particle size analysis. Hollow-stem auger borings were abandoned with a backfill (cuttings) and bentonite powder mix.

Samples were collected in each mud rotary borehole at the screened interval for lab analysis and analyzed for Suite A and C parameters. A Shelby tube was collected in the confining unit material in the deep boring at the GM-9 location. Shelby tubes were unsuccessfully attempted in the deep boring of GM-11. Analysis performed on the Shelby tube sample was identical to the Aquia samples listed above.

Wells were constructed in the mud rotary boreholes in each of the hilltop area cases. Well construction consisted of four-inch diameter Schedule 40, flush joint PVC. The two deeper wells (GM-9 and GM-11) were fitted with PVC/Teflon centralizers on a blank piece of casing below the screened section. Screens were either .010 slot or .020 slot. Water table wells were constructed with 25-foot screens, while intermediate and deep wells were constructed with 15-foot screens. Wells were constructed with gravel packs, bentonite pellet seals, and a bentonite/cement grout above the seal. A protective steel cover and concrete apron were included. Well construction details are presented in Table 4.

After well completion, well identification tags were placed on the steel covers. Tops of casing elevations and surface elevations were surveyed. The wells were then developed according to procedures outlined in Appendix B.

3.7 Task 7 -- Second Sampling Event (First Round of Sampling)

After completing Tasks 1 through 6, all monitor wells were sampled. Samples were collected from the 21 wells over a three-day period (March 28-30, 1988). Sampling procedures, protocols, and handling are outlined in Appendix B. Waters were analyzed for parameters in Suites A, C and EPA 602 VOCs. A state representative split several of the water samples during the sampling event. In addition to the specified sampling event, selected water samples (for Suite C) were field-filtered prior to lab analysis in an effort to distinguish between dissolved metals and metals sorbed to suspended sediments.

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Previous to the well-sampling event, nine water samples were collected and subsequently analyzed for Suite A VOCs (EPA method 601) from the ditch along Md. Rt. 450 at locations shown in Figure 3.

#### 4.0 RESULTS OF FIELD PROGRAM

This chapter presents the results of the field program. It is organized according to media (e.g., geology, ground water, septic systems, and soils) rather than according to the tasks described in Chapter 3.0. Complete data sets (e.g., boring logs and water quality analyses) are provided in the Appendices.

##### 4.1 Wastewater Disposal Systems

Honeywell maintains four systems of septic tanks and dry wells used for wastewater disposal (see Plate 1). Honeywell personnel completed a study of the wastewater streams and discharge conditions in June of 1987. Table 5 identifies ten wastewater streams with updated information concerning current disposal practices. Additional characterization of selected wastewater streams is provided in Table 6.

These wastewater streams were discharged to four disposal systems consisting of a series of septic tanks/pits and drywells. G&M investigated the physical features and geometry of the eleven dry wells and four septic tank/pits which make up the Honeywell wastewater disposal systems.

Septic tanks (ST-1, ST-3 and ST-6) are of typical rectangular concrete construction with top surfaces located just under ground surface. A single septic pumping pit (ST-14) is round and of concrete construction with a manhole access. Dry wells are of two general types of construction. The older dry wells (DW-4, DW-5, DW-7, DW-8, DW-9, DW-10, DW-11, DW-12, DW-13) are round and six to eight feet in diameter. They are constructed with concrete block sidewalls, a concrete top with an access port, and natural

TABLE 5. WASTEWATER STREAMS AT THE HONEYWELL SIGNAL ANALYSIS CENTER

WASTE STREAM	ESTIMATED GENERATION (in gallons)	ESTIMATED TOTAL (in gallons)	DISCHARGED TO	DISCHARGE PERIOD	AGENCY NOTIFICATION ***	CURRENT PRACTICE
1. Waste water from acid and caustic rinse tanks containing up to 170 ppb Trichloroethylene	2,500 per day	12,240,000	Drywell #9	1966 - 10/85	Yes *	All rinse waters on closed loop systems.
2. Trichloroethylene from vapor degreaser	25 per month	5,700	Drywell #9	1966 - 9/85	No **	Trichloroethylene usage stopped 10/85 at which time we switched to 1,1,1-Trichloroethane which is sent to a reclamation facility.
3. Waste water from chrome rinse tank	1,250 per day	3,575,000	Drywell #9	1966 - 7/77	Yes	In 1977, a closed loop system was installed and is still in operation.
4. Sludge resulting from the combination of sodium hydroxide solution and sulfuric acid solution.	400 per year	7,600	Drywell #9	1966 - 1985	Yes	Drummed and taken to an approved landfill.
5. Waste chromic acid solution	200 every other year	1,200	Drywell #9	1966 - 1977	Yes	Drummed and taken to an approved treatment facility.
6. Rinse water from air-water gun	2,400 per day	12,168,000	Drywell #9	1966 - 7/86	Yes	On closed loop system.
7. Non-contact cooling water from spot welders	4 per day	20,280	Drywell #9	1966 - 7/86	Yes	On closed loop system.
8. Waste laquer thinner and methyl ethyl ketone	15 per month	3,200	Septic Tank #6	1966 - 1984	No **	Drummed and taken to an approved treatment facility.
9. Waste isopropanol (mixture of solder flux and isopropanol)	5 per week	1,820	Ground surface N.E. of production building	1977 - 1984	No **	Drummed and taken to an approved treatment facility.
10. Discharges from electronic R&D and testing labs containing solvents, corrosives, and oils	≤ 55 every 6 months	550	Septic Tanks #1 & #3	1966 - 1986	No **	Employee education to reduce quantities. What is generated is packaged in lab packs and taken to an approved treatment facility.

Note: \* State auditor witnessed discharge. Samples were taken after the audit and results were received after waste streams had been put on closed loop system.

\*\* Information gathered in late 1986 through 1987 interviews with employees

\*\*\* Agency either notified by Agency Inspection or NPDES Permit application

TABLE 6. CHARACTERIZATION OF SELECTED WASTEWATER STREAMS

**Waste Chromic Acid Solution**

<u>EP Toxicity</u>	
Arsenic	<0.005 mg/l
Barium	1063 mg/l
Cadmium	0.40 mg/l
Chromium	2739 mg/l
Lead	<0.10 mg/l
Mercury	0.0032 mg/l
Selenium	<0.005 mg/l
Silver	0.007 mg/l
Total Organic Carbon	150 mg/l
Acidity (as percent)	0.77
Ammonia	11 mg/l
Cyanide (free)	2.85 mg/l
(total)	26.0 mg/l

**Waste Lacquer Thinner**

<u>EP Toxicity</u>	
Arsenic	<0.1 mg/l
Cadmium	<0.2 mg/l
Chromium	39.0 mg/l
Lead	4.1 mg/l

pH 6.0  
Flash point 73 F

**Waste Isopropanol**

<u>EP Toxicity</u>	
Arsenic	<0.2 mg/l
Cadmium	13.0 mg/l
Chromium	<2 mg/l
Lead	8.8 mg/l

pH 6.0  
Flash point 53 F

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formation or gravel bottoms. New construction dry wells (DW-15 and DW-16) are six to eight feet in diameter and constructed with a small diameter perforated pipe within a gravel envelope to approximately five feet below ground surface. Geotextile fabric covers the gravel envelope and is topped with native materials.

The four disposal systems shown in Plate 1 are as follows:

System A: (ST-14) - (ST-3) - (DW-4) - (DW-5) - (DW-16) -  
(DW-10) - (DW-11)  
System B: (ST-1) - (DW-8) - (DW-12)  
System C: (DW-9)  
System D: (ST-6) - (DW-7) - (DW-13) - (DW-15)

The disposal systems networks were developed in stages, with individual dry wells being added to a system as others failed and were abandoned. As a dry well became ineffective, it was usually disconnected from the system and a new dry well installed. For example, in disposal System A, after Dry Wells DW-5, DW-10 and DW-11 failed, they were disconnected from the system line at Dry Well DW-4. The line was rerouted to a newly installed dry well, DW-16.

Currently, disposal systems C & D and Dry Wells DW-5, DW-10, and DW-11 of system A are no longer on line.

Figures 5, 6, 7, and 8, illustrate the geometry of each dry well and septic tank/pit within a system, including total depth, sludge thickness, water column, height, and various elevations and disposition as of September, 1987. A description of each tank/pit and dry well follows.

ST-1 Septic Tank -- a 1,000-gallon metal tank was installed around 1956 by AAA Drywell Co. The metal tank was replaced in 1984 with a 1,500-gallon concrete tank by Smith and Rawlings. This septic

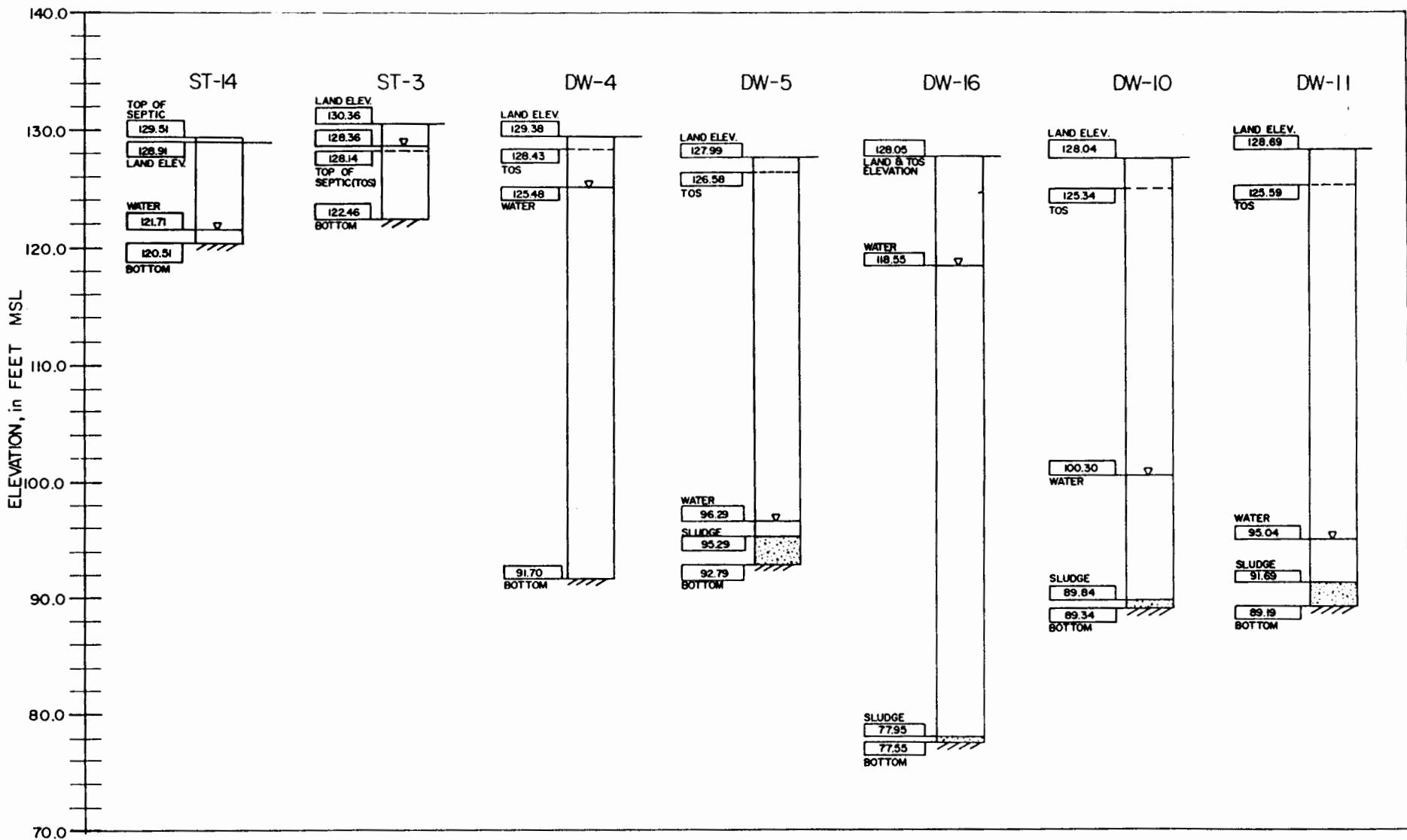


Figure 5. Disposal System A Components

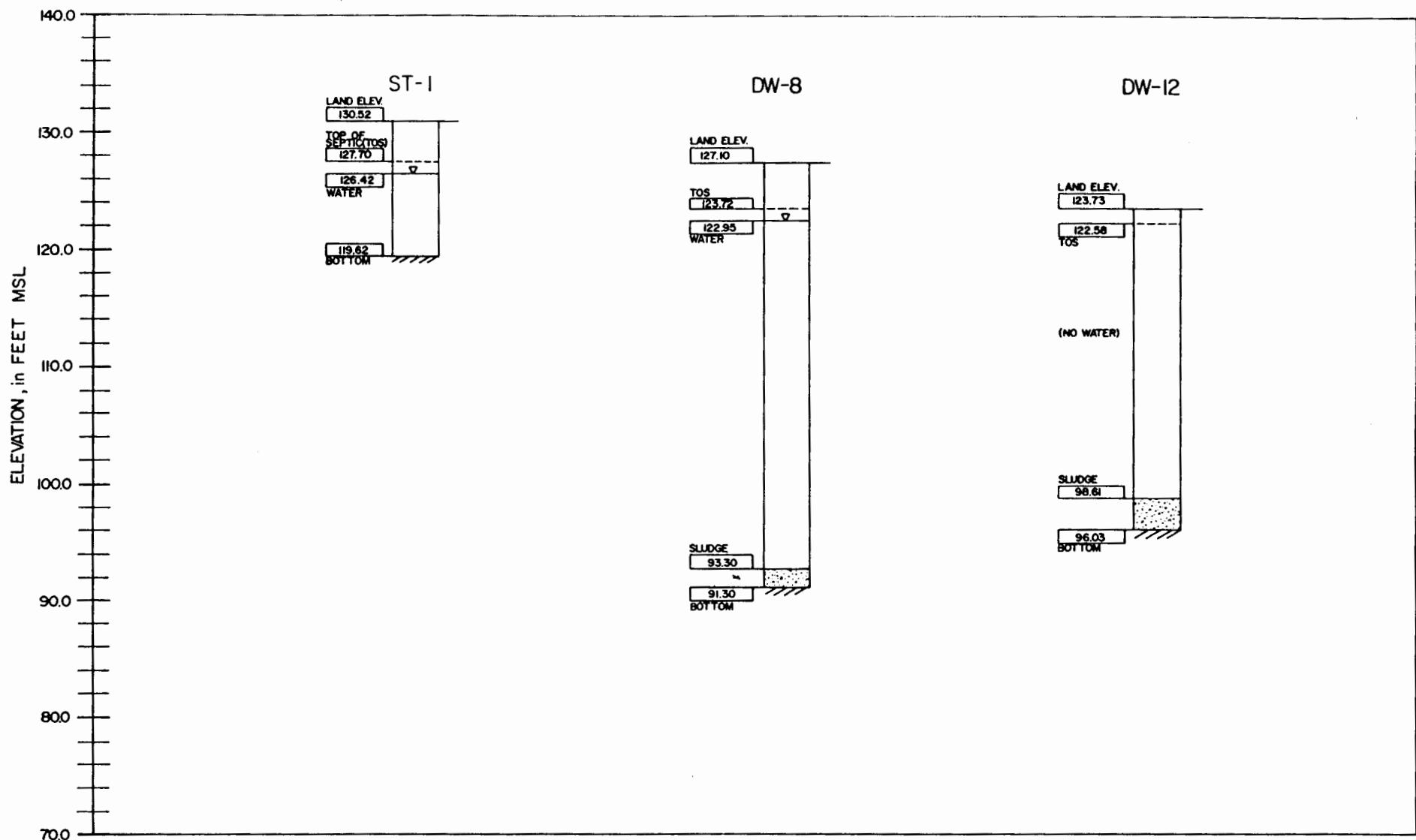


Figure 6. Disposal System B Components

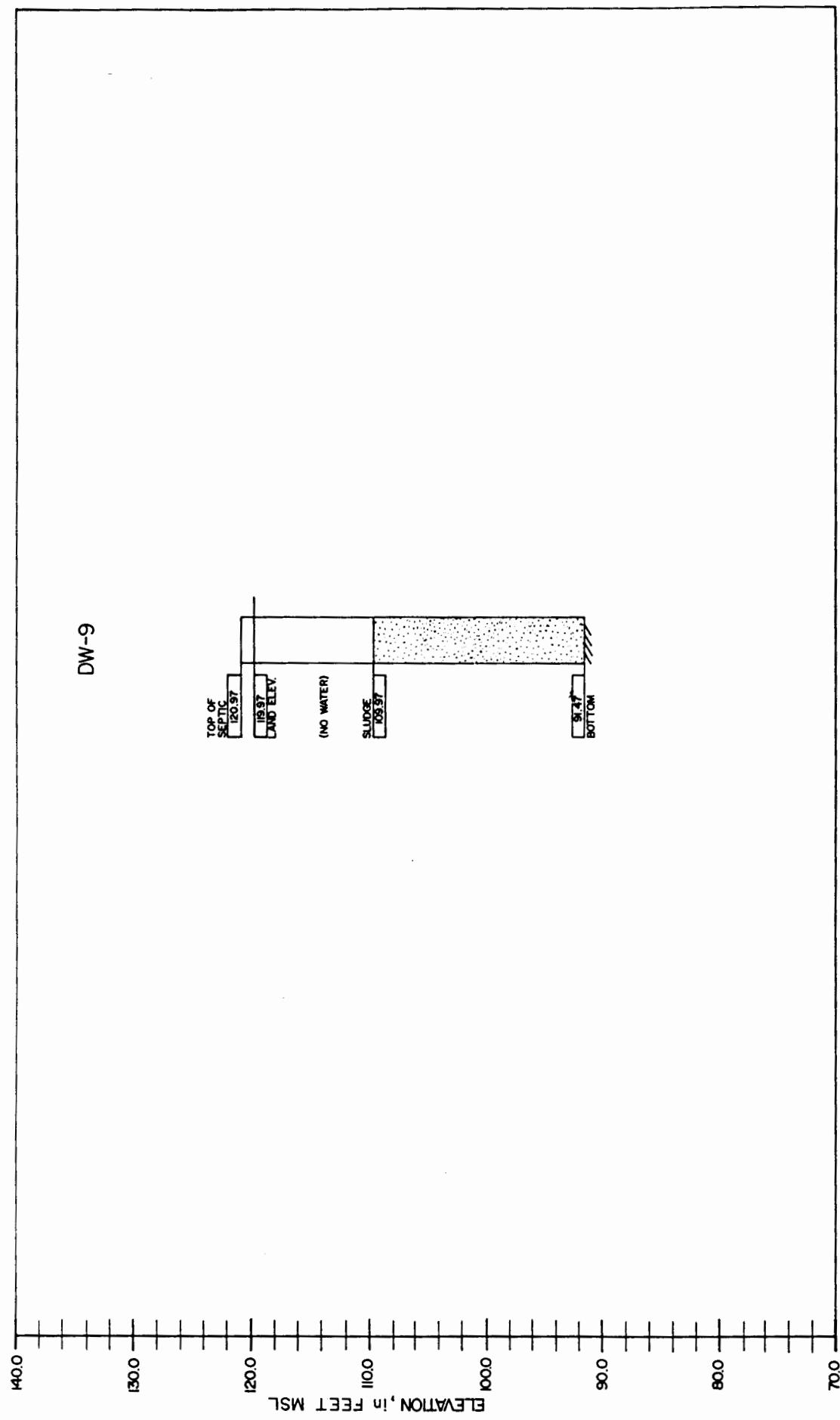


Figure 7. Disposal System C Components

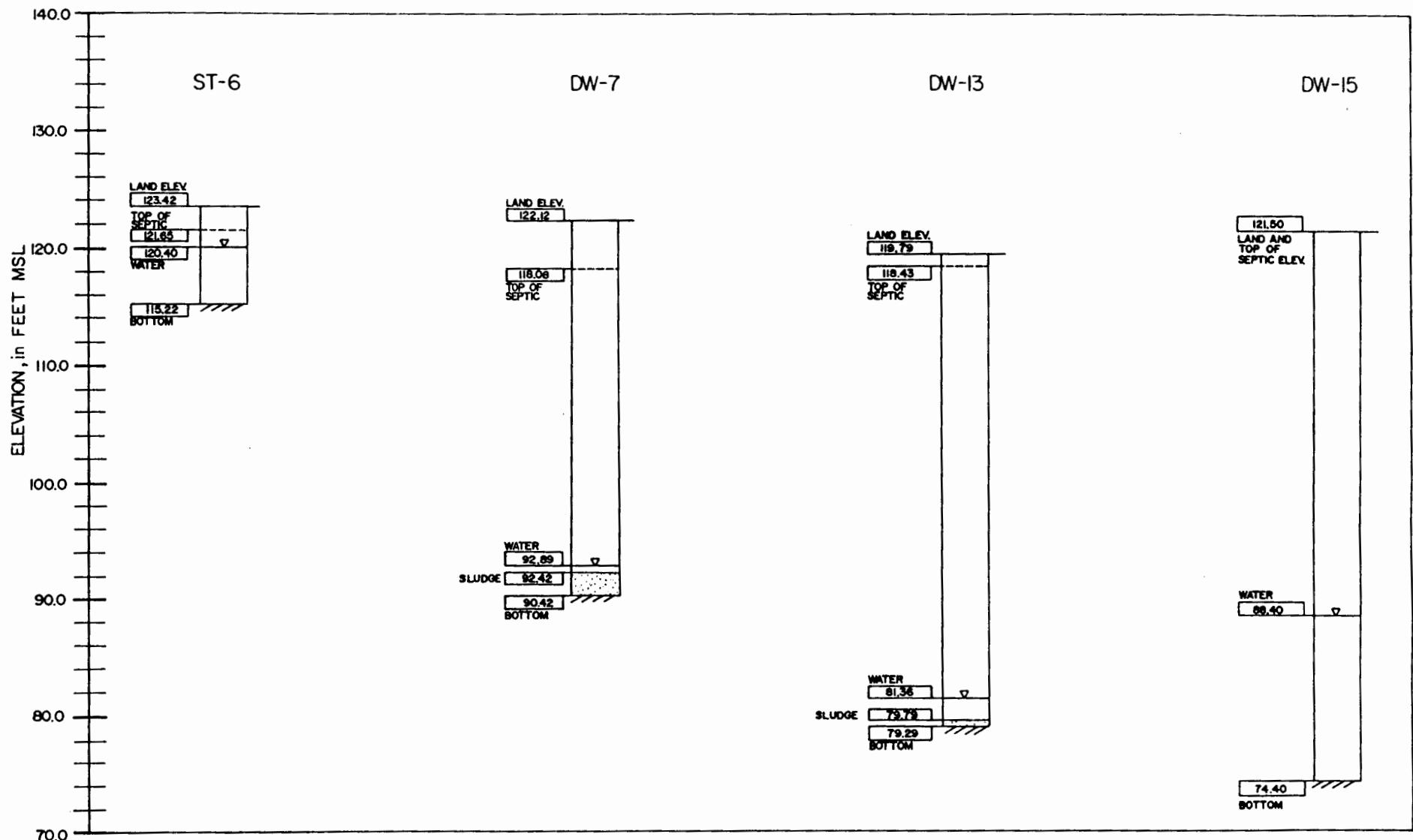


Figure 8. Disposal System D Components

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tank receives sanitary wastes from two restrooms and waters related to a sink in a small photography darkroom. This waste stream has remained constant since its installation. Solids are removed from the tank every three to six months.

- ST-3 Septic Tank -- a 1,200-gallon metal tank installed 1957-1958 by AAA Drywell Co. The tank was replaced in 1975 with a 1,500 concrete tank by AAA Drywell Co. This tank receives wastes from five restrooms, two janitor closets and a vending room sink. Solids are pumped out every three to six months.
- DW-4 Dry well -- Six feet in diameter and approximately 37-feet deep. Installed around 1957-1958 by AAA Drywell Co. This dry well receives wastewater from ST-3.
- DW-5 Dry well -- Six to eight feet in diameter and approximately 34-feet deep. Installed around 1969 or 1970 by AAA Drywell Co. This dry well received wastewater from ST-3. This dry well was disconnected in September 1986.
- ST-6 Septic Tank -- a 1,500-gallon concrete tank installed in 1961 by AAA Drywell Co. This tank receives sanitary wastes from two restrooms, sink in paint shop, sink in wave solder room, and sink in vending area. Solids are pumped out every three to six months.
- DW-7 Dry well -- Six to eight feet in diameter and 40-feet deep. Installed in 1961 by AAA Drywell Co. This dry well receives wastewater from ST-6.
- DW-8 Dry well -- Six to eight feet in diameter and approximately 32-feet deep. Installed in 1961 by AAA Drywell Co. This dry well receives wastewater from ST-1.
- DW-9 Dry well - Six feet in diameter and approximately 30 feet deep. Installed in 1961 by AAA Drywell Co. This dry well received wastewater from a plating and a welding shop. The wastewater from the welding shop was comprised of non-contact cooling water from two small spot welders. The wastewater from the plating shop consisted of rinse water containing sodium hydroxide and sulfuric acid. There were also periodic discharges of mixed sodium hydroxide and sulfuric acid solutions. Prior to 1977, this dry well also received rinse-water that contained chromium and waste chromic acid solution. Waste

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degreasing solvent was also periodically discharged into the dry well. All rinse-water discharges ceased in October 1985 leaving the non-contact cooling water as the only discharge to the dry well. All drains leading to this dry well were sealed in July 1986.

- DW-10 Dry well -- Six feet in diameter and approximately 36-feet deep. Installed in 1962 by AAA Drywell Co. This dry well received wastewater from ST-3. This dry well was disconnected in September 1986.
- DW-11 Dry well -- Six to eight feet in diameter and approximately 36-feet deep. Installed around 1975 by AAA Drywell Co. This dry well received wastewater from ST-3. This dry well was disconnected in September 1986.
- DW-12 Dry well -- Six to eight feet in diameter and approximately 27-feet deep. Installed in 1979 by Willson Septic Systems. This dry well receives wastewater from ST-1.
- DW-13 Dry well -- Eight feet in diameter and approximately 40-feet deep. Installed in 1980 by Willson Septic Systems. This dry well received wastewater from ST-6. This dry well was disconnected in December 1985.
- ST-14 Sewage Pit with Pump -- Installed in 1985 by Hawkins and Skubal. Receives sanitary waste from two restrooms and one janitor closet from new section of engineering building. This waste is pumped into ST-3.
- DW-15 Dry well -- Six to eight feet in diameter and approximately 47-feet deep. Installed in December 1985 by Southern Drywell. This dry well receives wastewater from ST-6.
- DW-16 Dry well -- Six to eight feet in diameter and approximately 51-feet deep. Installed in September 1986 by Southern Drywell. This dry well receives wastewater from ST-3.

4.2 Dry-Well and Septic Tank/Pit Contents

Dry-well liquids and sludges were sampled and analyzed for priority pollutant constituents (Suites C,D, and E), as described in Section 3.3.

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4.2.1 Dry-Well Sludges

Of the 11 dry wells present, nine had sufficient quantities of sludge-like material to sample (DW-5, DW-7, DW-8, DW-9, DW-10, DW-11, DW-12, DW-13 and DW-16). Chemical data from analyses performed on the sludge-like material are summarized in Appendix A Tables A.1.1 and A.1.2.

A combined total of sixteen different VOCs from the nine dry wells were identified as follows:

- methylene chloride
- acetone
- carbon disulfide
- 1,1-dichloroethene (DCE)
- 1,1-dichloroethane (DCA)
- 1,2-dichloroethene
- 1,2-dichloroethane
- 1,1,1-trichloroethane (TCA)
- 2-butanone
- benzene
- carbon tetrachloride
- trichloroethene (TCE)
- tetrachloroethene (PCE)
- toluene
- ethylbenzene
- total xylene

Generally, quantified VOCs had concentrations in the low part-per-billion range, except for Dry Well DW-9. Note that benzene was only detected in Dry Well DW-7 (sample I.D. DWS-7-1), and its concentration was below the quantitation limits.

Dry well DW-9 was found to have elevated levels of 11 VOCs. The most abundant of them were TCE (concentrations up to 19,670 mg/Kg), PCE (concentrations up to 3,050 mg/kg) and TCA (concentrations up to 2,710 mg/kg).

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Rigorous acid digestion methods for the following metals: arsenic, barium, cadmium, chromium, mercury, lead, selenium and silver indicated slightly elevated concentrations in all dry-well sludges sampled. The highest metal concentrations were found in the sludges from Dry Well DW-9. However, Extraction Procedure Toxicity (EP Tox) analysis on the same sludges (Table A.1.3) show metal concentrations lower than RCRA standards defining hazardous waste.

### 4.2.2 Dry-Well Liquids

Seven of the dry wells present had sufficient quantities of liquid for sampling (DW-4, DW-8, DW-10, DW-11, DW-13, DW-15 and DW-16). Summaries of the organic and inorganic data from the dry-well liquids can be found in Appendix A.1 Tables A.1.4 and A.1.5.

A total of seven different VOCs were identified at very low concentrations in the dry-well liquids (i.e., less than 50 ppb). The compounds included TCA, DCA, chloroform, methylene chloride, PCE, TCE and toluene. Of the seven VOCs found, toluene was the most frequently occurring. Concentrations for toluene ranged from 30 to 45.

Laboratory data from total digestion analyses for metals indicate the presence of very low concentrations of nine metals in the dry-well liquids (silver, barium, cyanide, chromium, copper, mercury, nickel, lead and zinc). Of the dry-well liquids tested, DW-13 generally had the highest concentrations of metals in liquids. The lead level in Dry Well DW-13 was 0.20 ppm and the chromium level was 0.76 ppm. All other quantified metals were close to or below drinking water standards.

#### 4.2.3 Septic Tank/Pit Liquids

All three septic tanks (ST-1, ST-3 and ST-6) and the septic pumping pit (ST-14) had sufficient volumes of liquid in them for sampling purposes. Organic and inorganic analytical results are summarized in Appendix A.1 Tables A.1.4 and A.1.5.

Four different VOCs were detected at low concentrations in the septic liquids (TCA, DCA, PCE and toluene). Toluene was the only VOC detected in septic tanks ST-1, ST-3 and ST-14. The concentration ranged from 25 ppb in ST-14 to 200 ppb in ST-1. Septic tank ST-6 had no traces of toluene but contained TCA (56 ppb), DCA (16 ppb) and PCE (3 ppb).

Inorganic constituents found in the septic liquids were silver, cyanide, chromium, copper, mercury, nickel and zinc. All concentrations of these components were at levels comparable to those set forth in drinking water standards.

### 4.3 Geology/Hydrogeology

#### 4.3.1 Regional Geology/Hydrogeology

The Honeywell facility, according to the geologic map of Anne Arundel County (Glaser 1976) is underlain by stratified, unconsolidated coastal plain sediments. Figure 9 is a regional geologic cross section through the county and near the Honeywell site (Mack 1962). It illustrates the configuration of each of the major geologic formations. On a regional scale, the unconsolidated Coastal Plain sediments are wedge-shaped, with the contact between the sediments and underlying crystalline rock becoming deeper down to the southeast. Stratigraphic, hydrogeologic, and lithologic

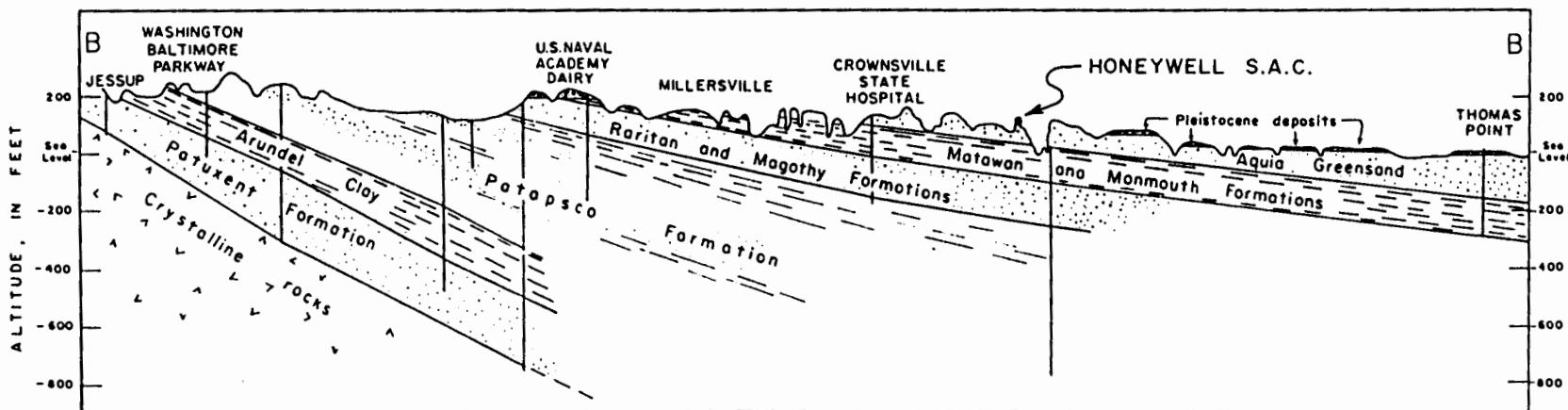
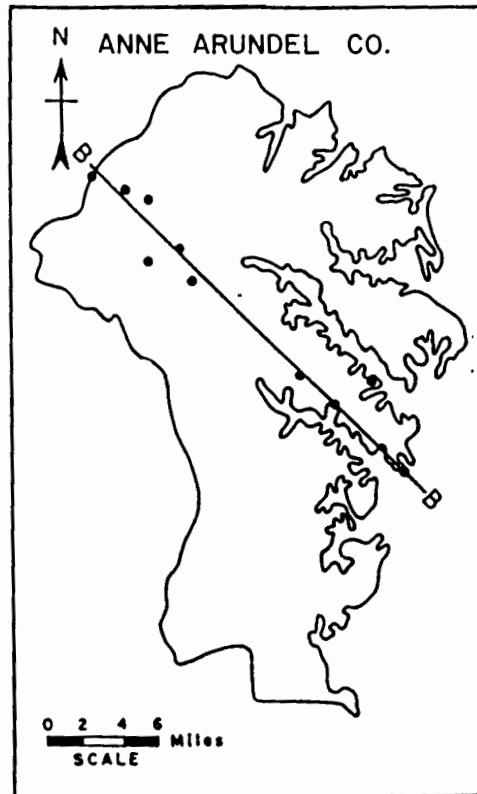


Figure 9. Regional Geologic Cross Section (Source: Mack 1962)

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characteristics of these geologic formations in the Annapolis area are shown in Table 7. Generalized surficial geology (shown in Figure 10) indicates the Honeywell site is located in the outcrop area of the Aquia Formation.

The unconsolidated Coastal Plain deposits comprise the major water-supply aquifers, including the Aquia, Magothy, Patapsco, and Patuxent Formations. Confining layers or water restrictive layers include the Monmouth/Matawan formation and clay units of the Potomac group.

A literature review found little information concerning hydraulic characteristics of the Aquia and Monmouth/Matawan formations in the vicinity of the Honeywell site. Transmissivity for the Aquia Aquifer has been estimated to range between 100 - 5500 ft<sup>2</sup>/day (DNR 1982). Kapple and Hansen reported a transmissivity of 865 ft<sup>2</sup>/day at a Parole location. The storage coefficient ranges between .0001 and .0004 (confined conditions) but may be as high as 0.15 in the water-table portion (outcrop area) of the Aquifer (DNR 1982). Thickness of the formation ranges between 0 and 250 feet on a regional scale (DNR 1982) with a dip from less than 15 to nearly 30 feet-per-mile to the southeast (Mack 1962).

The vertical conductivity of the Matawan is estimated to be  $1.5 \times 10^{-4}$  ft/day (Mack 1974). Values from laboratory methods range from  $1.16 \times 10^{-4}$  to  $5.68 \times 10^{-5}$  ft/day from consolidation tests while values range from  $3.68 \times 10^{-3}$  to  $2.56 \times 10^{-5}$  ft/day from constant flow tests (Mack 1974). Porosity has been estimated on the order of 0.45 for materials with similar textures (Shultz 1983a).

Water quality in the Aquia Formation is generally good. In the Annapolis area, pH ranges from 5.2 to 6.1 while in the

TABLE 7. STRATOGEOGRAPHIC, HYDROGEOLOGIC AND LITHOLOGIC CHARACTERISTICS OF GEOLOGIC FORMATIONS IN THE ANNAPOLIS AREA. (SOURCE: Mack 1974)

System	Series	Group	Formation	Average thickness (feet)	Lithology	Hydrologic character	General character
Quaternary	Holocene and Pleistocene			30	.....	Confining bed in most places. Poor aquifer in some places.	Sand, gravel, silt, and clay.
Tertiary	Eocene	Pamunkey	Manjemoy	80	.....	Confining bed	Sand, with clayey layers, glauconitic.
			Marlboro Clay 1/	30	.....	Confining bed	Clay, plastic, pale-red
	Paleocene		Aquia	100	.....	Aquifer	Glauconitic, gray to brown sand, with interbedded or "rock" layers in middle and basal parts.
			Brightseat	40	.....	Confining bed in most places. Poor aquifer in some places.	Sand, silt, and clay, olive-gray to black, glauconitic
Cretaceous	Upper Cretaceous		Monmouth	90	.....	Poor aquifer in places	Sand, silty to fine, with some glauconite.
			Matawan	30	.....	Confining bed	Silt and fine sand, clayey dark gray to black, glauconitic.
			Magothy	175	.....	Aquifer	Sand, light gray to white, with interbedded thin layers of organic black clay. Contains pyrite and lignite. Lower part composed of interbedded layers of sand and white to light gray clay. Layers of coarse sand and gravel near the base.
	Lower Cretaceous	Potomac	Patapsco	500	..... ..... ..... ..... .....	Confining bed Aquifer Confining bed Aquifer Confining bed Aquifer	Sand layers interbedded with thick clay. Color variegated b. chiefly hues of red and yellow.
			Arundel Clay	250 ?	.....	Confining bed	Clay, red brown, and gray, contains some ironstone nodules and plant remains.
			Patuxent	250 ?	..... ?..... ?.....	Aquifer ? Confining bed Aquifer ?	Sand, gray and yellow, with interbedded clay; kaolinized feldspar and lignite common. Locally clay layers predominate.
			Unknown		^ V ^ L V ^ <	Confining bed	Probably gneiss, granite, gabbro, metagabbro, quartz diorite and granitized schist.
Precambrian or Early Cambrian							

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SOURCE:  
MARYLAND DEPARTMENT OF GEOLOGY, MINES AND WATER RESOURCES

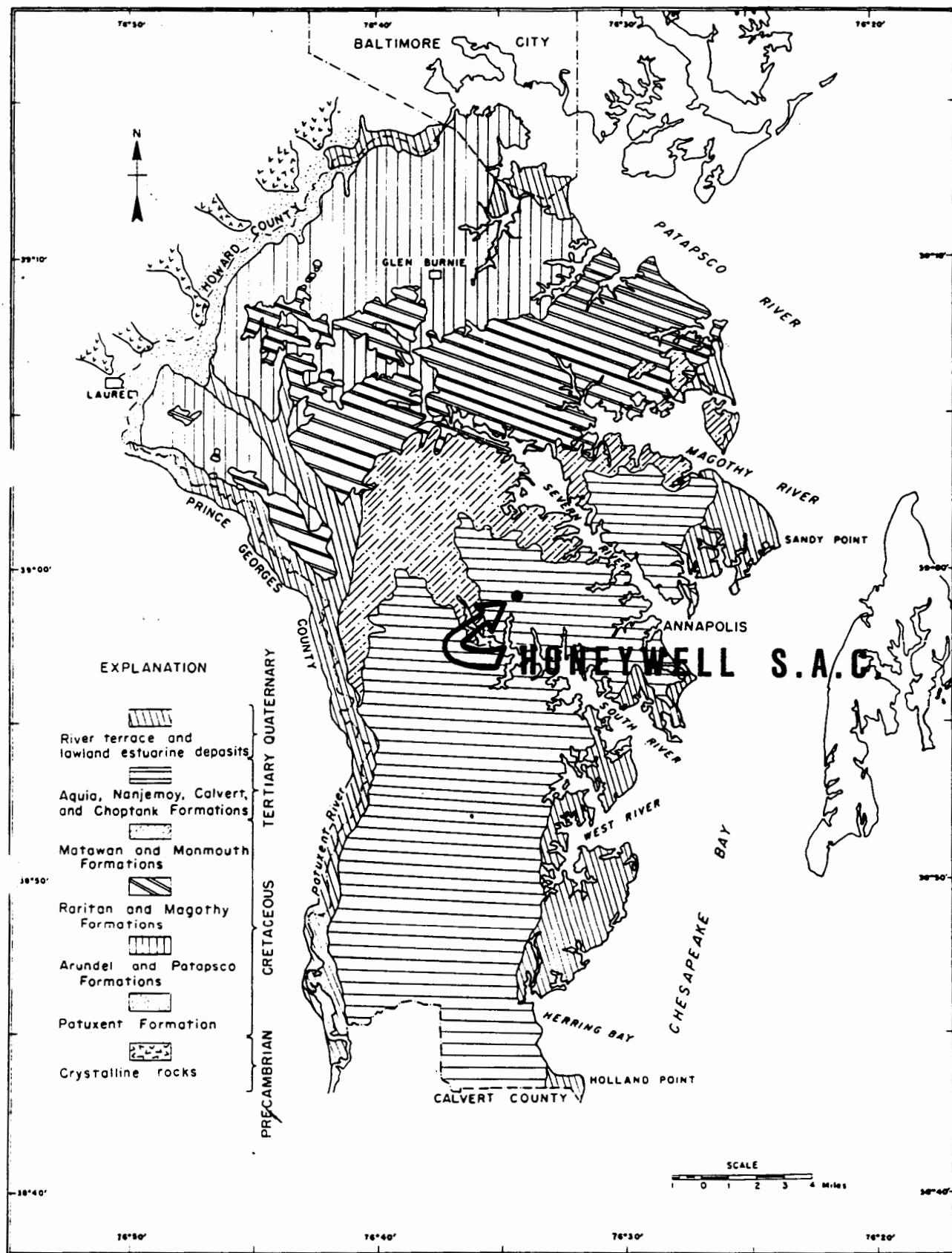


Figure 10. Generalized Surficial Geology of Anne Arundel County, Maryland (Source: Mack 1962)

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down-dip areas where the formation is under artesian condition, pH usually ranges from 7.0 to 8.5 (DNR 1982). Regional pH data collected from Aquia and Magothy wells around the site show a greater range between 5.2 and 8.1 (see Table 8) (DNR 1978). See Figures 11, 12 and 13 for data collection points.

Iron concentrations in the outcrop area may exceed the secondary drinking water standards of 0.3 ppm. In the Annapolis area 0.44 - 1.3 is considered the natural range. Ranges of .120 to 20.0 occur near the site according to water-quality data. Specific Conductivity ranges from 48 to 399 umhos in those wells tested. Dissolved solids range from 121 to 238 in the water-quality report. Natural TDS in the Annapolis area is 121 ppm (DNR 1982).

Comparative data show that pH, specific conductivity, and total dissolved solids are lower than Aquia formation values in the Magothy Aquifer, while iron concentrations are generally higher.

Background data on barium, chromium, and other Suite C metals found in soils or ground water were not found in the literature.

Excerpts from the geologic map of Anne Arundel County (Glaser 1976) are provided below for the upper geologic units at the Honeywell site.

Marlboro Clay

Plastic clay with silt partings and minor lenses. Clay finely-laminated, or thick-bedded to massive, silt massive, laminated or rarely, ripple cross-laminated. Upper portion of clay laced with cylindrical burrows filled with glauconitic sand. Clay color silvery-gray in uppermost and lowermost several feet of unit, pale-red to reddish-brown in middle portion. Silt buff or dirty white, micaceous.

TABLE 8.  
REGIONAL GROUND-WATER QUALITY DATA (Source: DNR 1978)

WELL ID	DATE	UNIT	ELEV. (Ft.)	DEPTH (ft.)	Fe (ug/L)	DS (mg/L)	SC (umhos)	pH (units)	TEMP. (Cent.)	Cu (ug/L)	Zn (ug/L)
1	04-01-46	MGTY	12	213	30000	53	86	5.3	...	...	1500
3	04-25-32	MGTY	40	244	26000	66	...	...	...	...	...
3	02-15-43	MGTY	40	244	8800	...	101	5.9	...	...	...
6	03-14-46	MGTY	180	153	E1100	...	166	6.5	...	...	...
14	04-01-46	MGTY	2.0	140	1100	29	69	3.9	14.0	...	...
18	02-28-46	MGTY	1.0	90	E8100	...	167	3.5	14.5	...	...
19	05-06-46	MGTY	180	208	1200	47	93	4.0	13.5	...	<500
42	07-19-46	MGTY	14	230	14000	...	181	6.3	16.0	...	...
42	10-24-70	MGTY	105	275	6600	132	183	7.4	14.0	...	...
43	03-09-60	MGTY	130	285	2000	...	93	4.0	13.5	20	400
46	05-08-46	MGTY	3.0	96	11000	62	94	5.6	13.5	...	...
47	04-25-32	MGTY	20	258	11000	62	...	...	...	...	...
69	02-23-60	MGTY	15	202	13000	86	159	3.9	13.5	10	500
69	03-01-60	MGTY	60	325	13000	...	137	6.7	15.0	...	...
83	06-02-60	MGTY	75	29	150	84	125	5.9	15.0	510	800
88	03-10-60	MGTY	120	345	9000	...	101	6.6	14.5	...	...
104	11-07-68	MGTY	50	...	18000	...	...	7.0	...	...	...
104	11-07-68	MGTY	50	345	18000	115	200	7.0	16.0	...	...
104	10-30-68	MGTY	50	460	17000	101	170	7.0	16.0	...	...
11	06-11-46	AQUI	100	85	120	...	48	5.7	...	...	...
12	06-11-46	AQUI	70	65	880	...	52	6.1	...	...	...
20	06-14-46	AQUI	35	31	660	121	144	5.2	14.0	...	...
25	03-07-60	AQUI	165	166	20000	...	148	6.7	13.0	...	...
32	03-07-60	AQUI	120	200	8200	...	127	7.0	11.5	...	...
34	06-25-46	AQUI	32	60	440	...	104	5.5	...	...	...
35	06-25-46	AQUI	10	81	1400	238	365	7.8	13.5	...	...
64	03-02-60	AQUI	30	55	340	...	206	7.6	14.5	...	...
89	03-10-60	AQUI	130	125	1300	...	54	6.5	13.0	...	...
90	03-02-60	AQUI	30	90	780	...	352	7.9	14.5	...	...
105	11-22-68	AQUI	50	83	2800	234	399	8.1	14.0	...	...

... Parameter not analyzed.

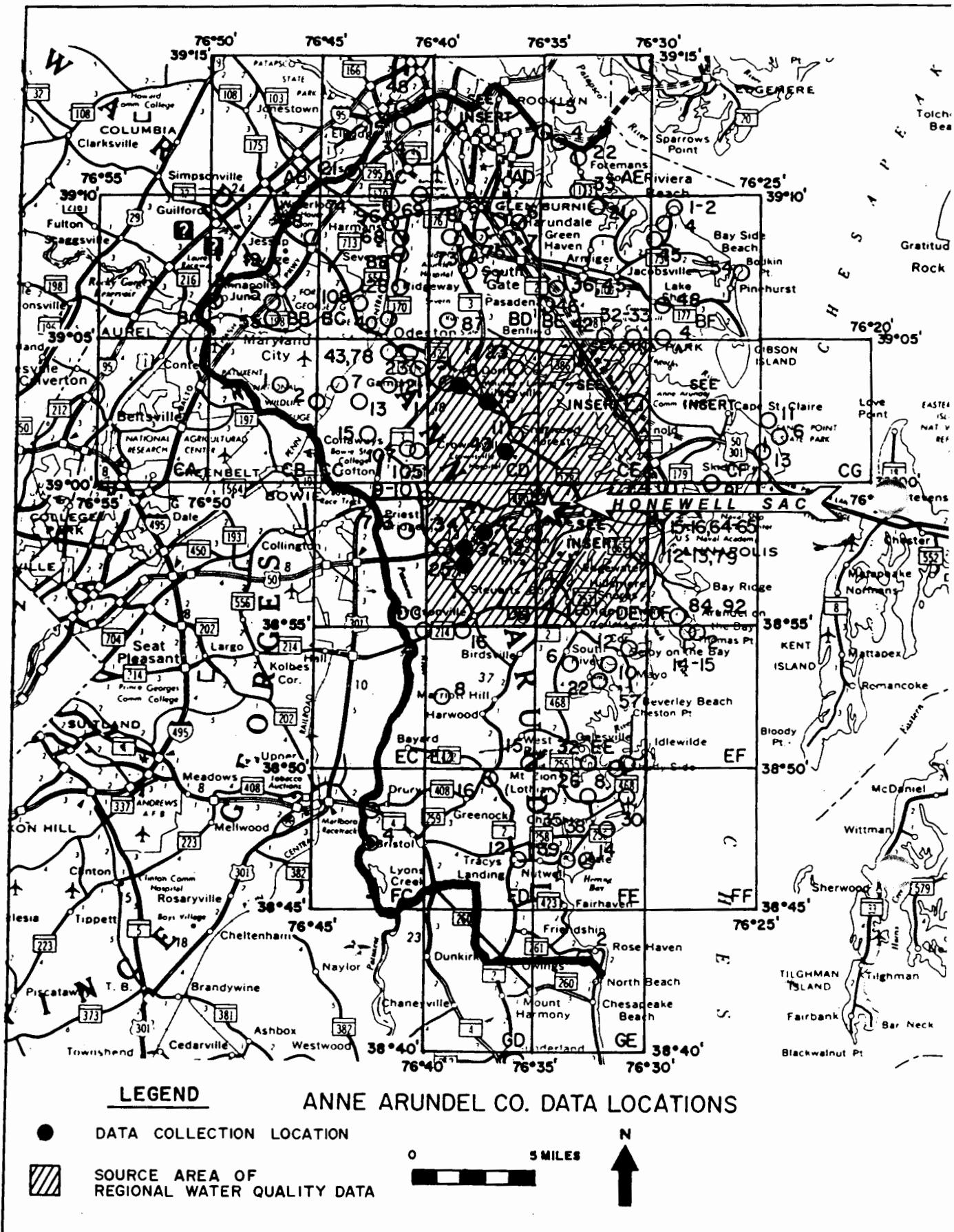
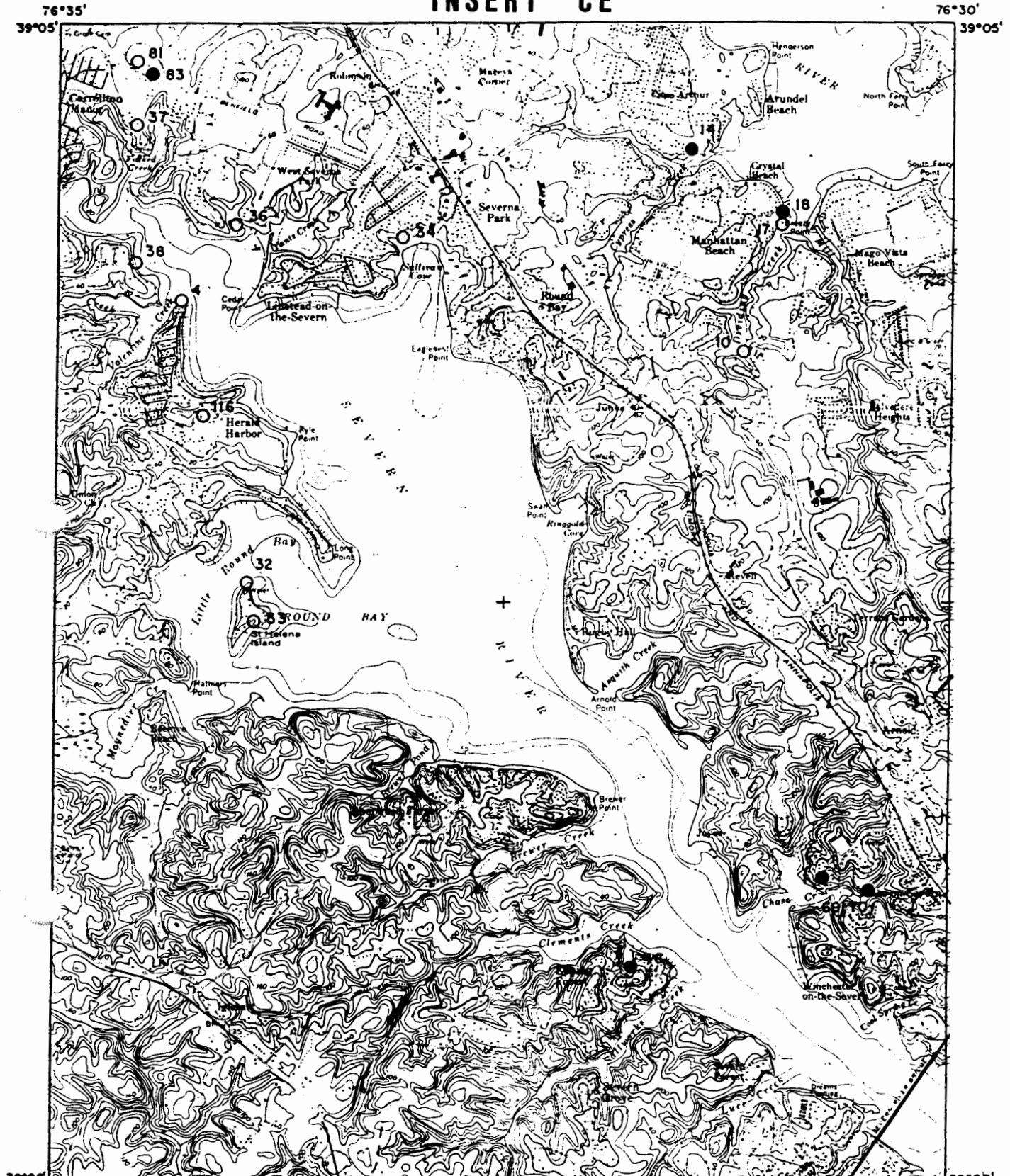


Figure 11. Regional Water Quality Sampling Locations (Source: DNR 197

## INSERT CE

LEGEND

- DATA COLLECTION LOCATION

Figure 12. Regional Water Quality Sampling Locations  
Insert CE (Source: DNR 1978)

LEGEND

- DATA COLLECTION LOCATION

1      1/2      0      1 Mile

N

Figure 13. Regional Water Quality Sampling Locations  
Insert DE (Source: DNR 1978)

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Macrofauna rare, limited to tiny mollusks, mostly gray in color.

Aquia Formation

Glauconitic sand, clean to moderately clayey, and calcareous sandstone. Well-sorted, medium-grained sand dominant but fine or coarse-grained in places. Color dark gray-green or olive-green where unweathered, "salt and pepper" sand where moderately weathered, and rusty brown with abundant limonite crusts and pods where deeply weathered. Bedding massive or thick-bedded with abundant burrow mottling. Highly fossiliferous in places with large oysters and Turritella dominant. Glauconite proportions variable, rarely exceeding 50% of the sediment.

Brightseat Formation

Sand, variably clayey, predominantly fine-grained, poorly-sorted, variably glauconitic. Color dark gray to dark greenish-gray where fresh, pale-gray to tan in weathered outcrops. In places, the basal Brightseat contains some medium to coarse sand with granules, small pebbles, phosphatic clasts, and scattered fish teeth. The proportions of glauconite in the unit range up to 25%, but are generally much less; molluscan casts are present but uncommon.

Monmouth Formation

and

Matawan Formation

Sand, very fine to fine-grained, poorly to moderately well-sorted, variably glauconitic, and micaceous clayey silt. Color dark gray to olive-black where fresh, buff to pinkish-gray in weathered outcrops. Generally thick-bedded to massive with abundant burrow mottling; molds and casts of shells common in places. Large (to 6 ft. in diameter) lobate or ellipsoidal sideritic concentrations present in upper part of section.

Magothy Formation

Sand, fine to course-grained, interstratified with silt-clay and subordinate pebbly sand or gravel. Quartz sand predominant (80% or more of unit), mostly fine to medium-grained, well-sorted to very muddy, lignitic in some beds, commonly sugary in appearance. Cross-bedded, laminated, lenticular, or rarely massive and thick-bedded. Color white to pale-gray. Sand interbedded, particularly northeast of the Severn River, with closely-interlaminated dark gray silt-clay and very fine sand or silt, dense chocolate or dark gray clay or massive, dark gray silt-clay with abundant carbonaceous debris. Pyrite aggregates common in silt-clay. Updip exposures of the Magothy show considerable fine to medium gravel, pebbly sand, and coarse sand, with ferruginous staining and partial cementation.

4.3.2 Site Geology

The characteristics and geometry of the geologic units underlying the site were determined from borehole logs (see Appendix G), geophysical logs, and laboratory testing. Site investigations generally confirmed regional geology. A cross section along transect A-A' showing the geologic units is presented in Figure 14. A map showing site topography is provided in Figure 15. Borehole geophysical data are shown in Figures 16, 17, 18 and 19.

Although remnants of Marlboro clay exists in a thin layer at some hilltop locations, the Aquia Formation is generally found at the surface. It extends to the contact with the Brightseat Formation at an elevation of -2 to -6 feet msl (see Figure 14). The contact between the Brightseat and Monmouth/Matawan Formation occurs in a narrow range between -39 and -40 feet msl. Since the Monmouth/Matawan formations were not penetrated, no site-specific information concerning the Magothy formation can be provided. However, based on information from the Annapolis well field and the Annapolis Sanitary Landfill, the top of the Magothy Formation

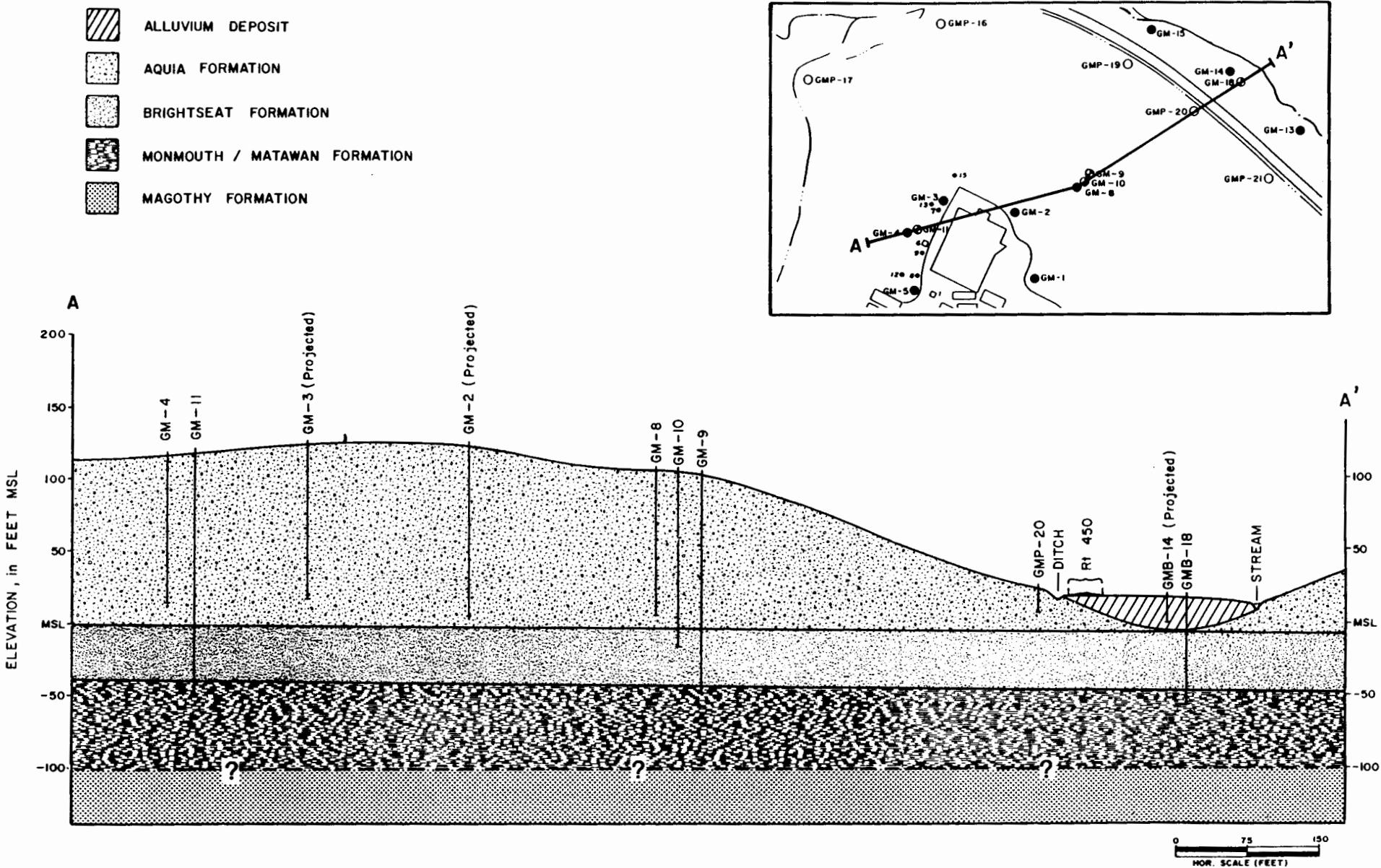


Figure 14. Geologic Cross Section A-A'

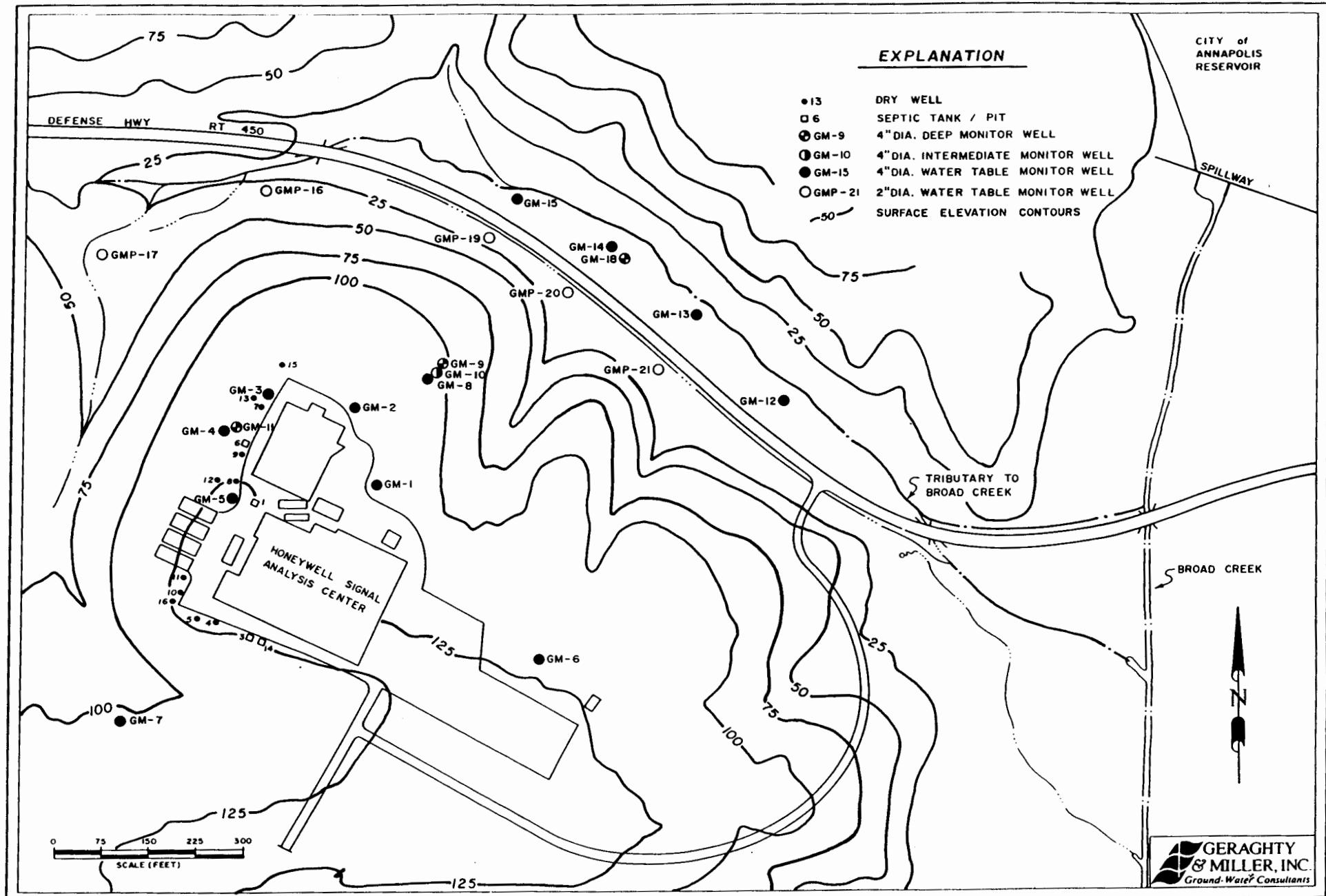


Figure 15. Site Topography

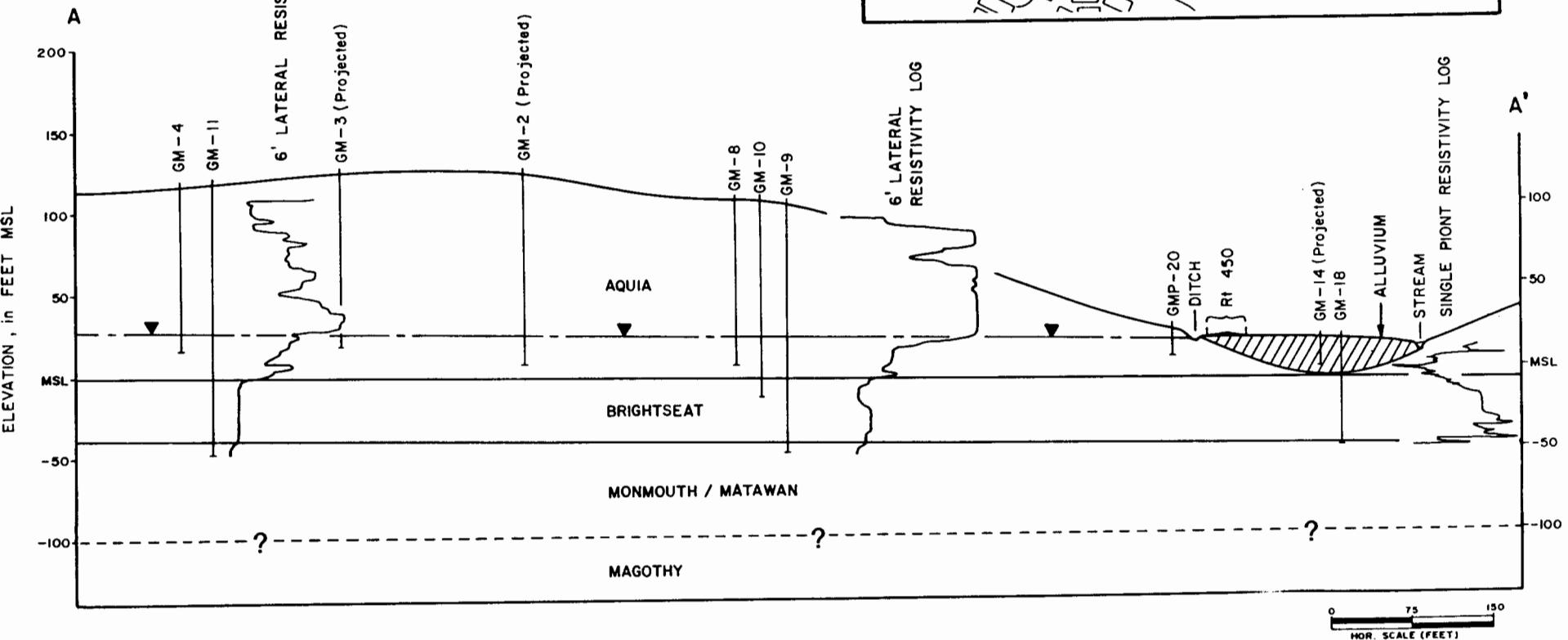


Figure 16. Cross-Section A-A' Showing Borehole Geophysics Relationship

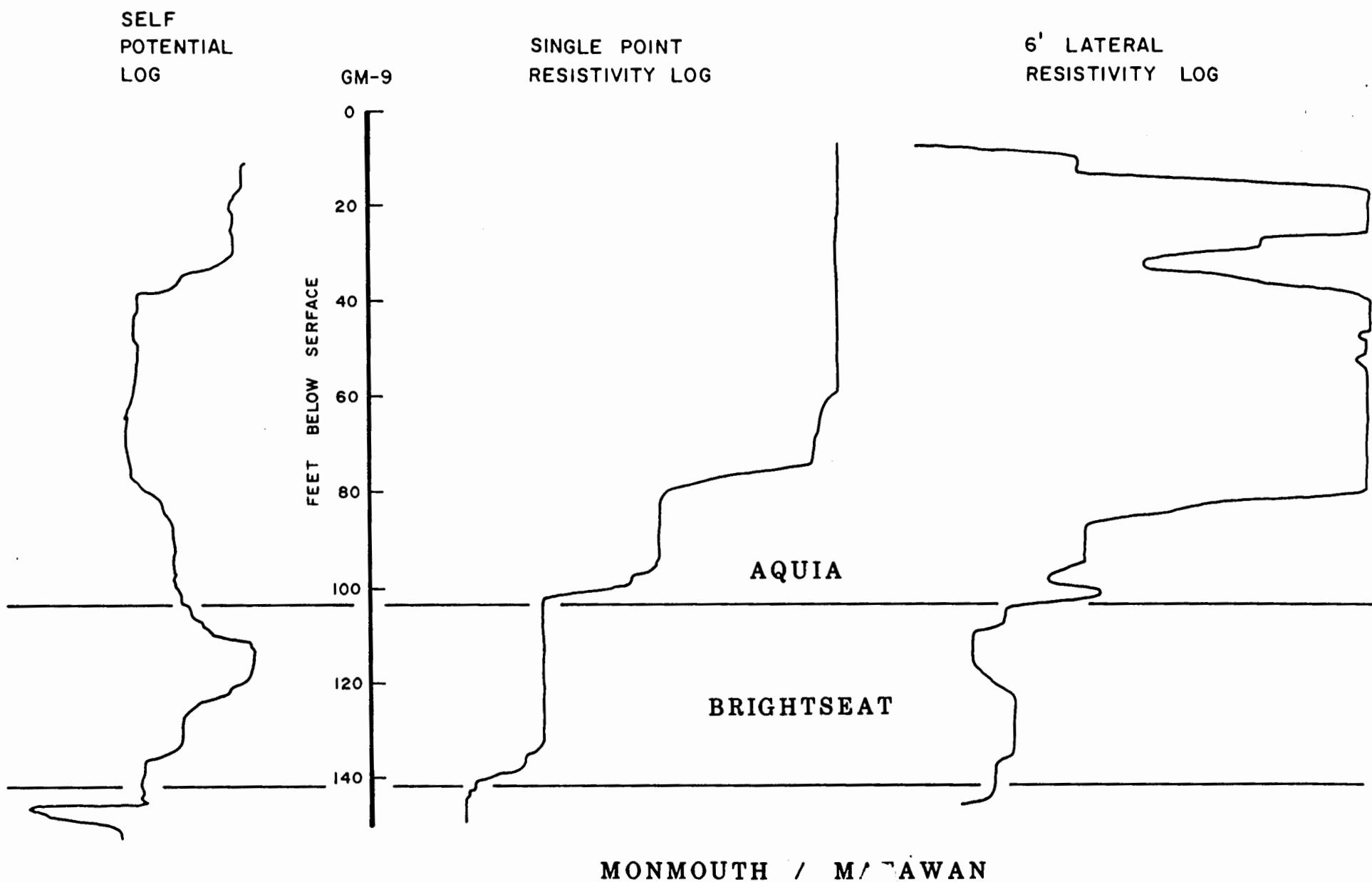


Figure 17. Borehole Geophysical Logs for Well GM-9

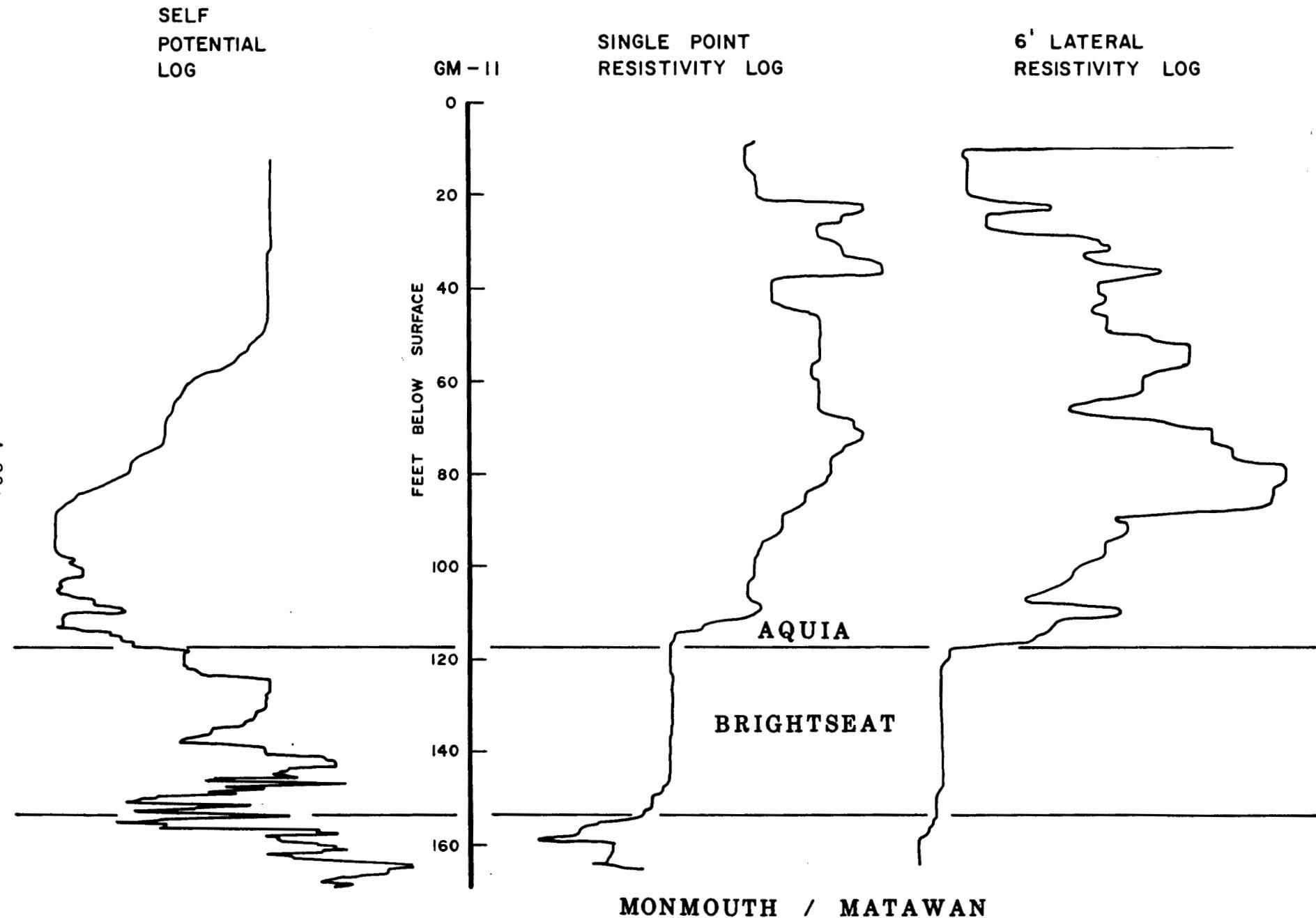
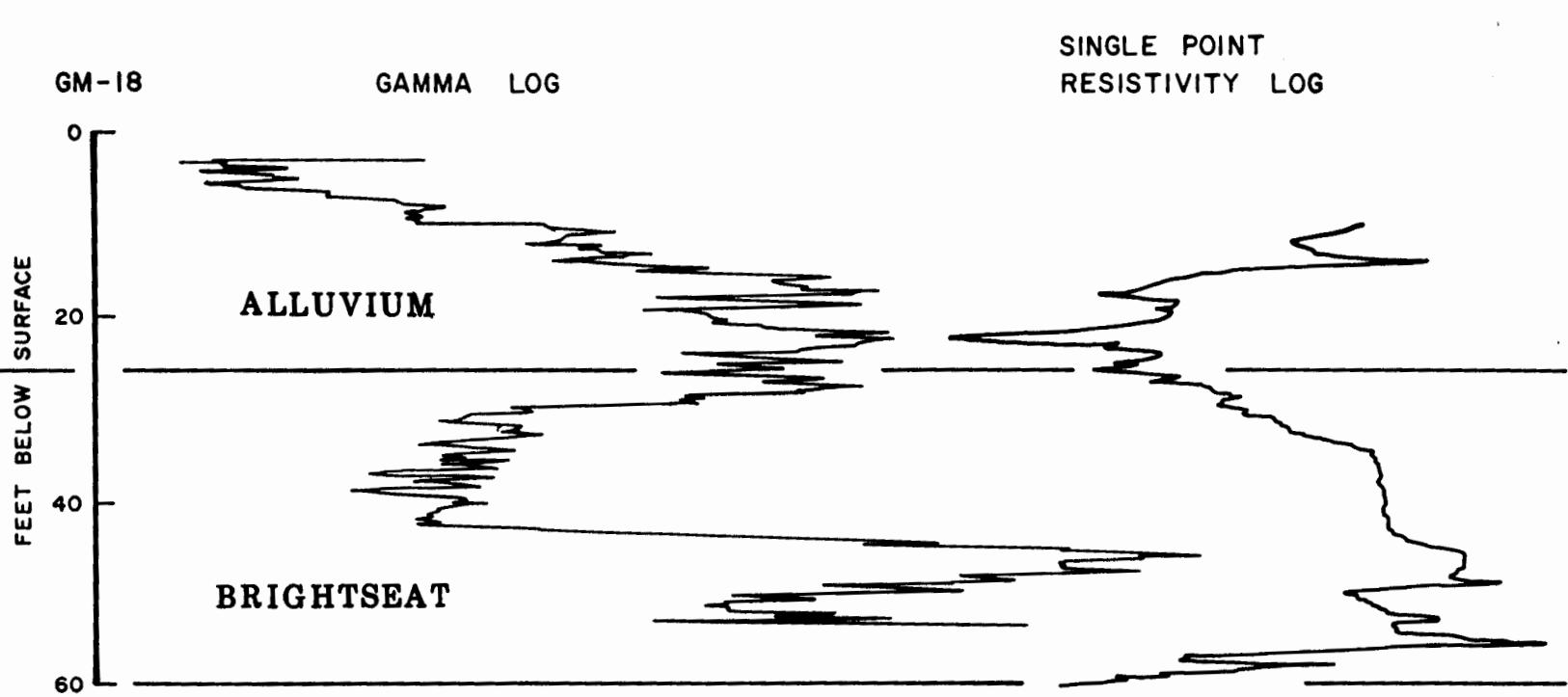


Figure 18. Borehole Geophysical Logs for Well GM-11

SELF  
POTENTIAL  
LOG



MONMOUTH / MATAWAN

Figure 19. Borehole Geophysical Logs for Well GM-18

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ranges between ~110 (Shultz 1983b) and ~75 feet msl (Shultz 1983a).

On site, the Aquia Formation consists primarily of fine to medium sand, some silt and clay, and occasionally iron cemented sand stone (ironstone). Formation colors include red, orange, brown, green, yellow, black and white ("salt and pepper") and mixed combinations. Some variations in ironstone color (from brown to purple and maroon) were present. The formation materials were generally homogenous throughout the site. Individual layers within a specific borehole were found to be discontinuous across the site.

Analysis of Shelby tube samples (GMB-6T, GMB-7T and GMB-8T) is summarized in Table 9. Laboratory certificates are provided in Appendix H.

The Brightseat Formation is similar in texture to the overlying Aquia Formation, greenish grey fine sand, with silt and some clay. Color variation primarily distinguished the two formations, although an increase in finer textured materials and lack of ironstones were also noted. No in situ or laboratory analyses were performed for the Brightseat Formation.

Monmouth/Matawan Formation materials on site have the same colors as the Brightseat Formation. A marked increase in clay content distinguished the two. Analysis of Shelby tube samples (GM-9T and GM-18T) is summarized in Table 9. Laboratory certificates are in Appendix H.

### 4.3.3 Site Hydrogeology

In the vicinity of the Honeywell facility, the uppermost aquifer occurs in the Aquia and Brightseat Formations and is

TABLE 9  
RESULTS OF ANALYSIS ON SHELBY TUBE SAMPLES

<u>Formation/ Sample No.</u>	<u>Texture (Percent)</u>			<u>Classification</u>	<u>Porosity</u>	<u>Permeability</u>	<u>Vertical</u>
	<u>Silt/ Clay</u>	<u>Sand</u>	<u>Gravel</u>	<u>U.S.C.</u>		<u>cm/sec</u>	<u>ft/day</u>
<b>AQUIA</b>							
GMB-6T	6	94	--	SP	0.41	$3.5 \times 10^{-4}$	0.99
GMB-7T	20	80	--	(SM)	0.52	$1.1 \times 10^{-3}$	3.12
GMB-8T	24	76	--	(SM)	0.44	$2.1 \times 10^{-4}$	0.60
<b>MONMOUTH/ MATAWAN</b>							
GM-9T	58	40	2	(ML)	0.43	$1.6 \times 10^{-5}$	0.045
GM-18T	71	29	--	(ML)	0.43	$1.4 \times 10^{-7}$	$3.97 \times 10^{-4}$

unconfined. Depth to water ranges from 95 feet on the hilltop to one foot along Md. Rt. 450. Though topographic relief varies greatly in the immediate area, ground-water table elevations, as shown in Figure 20, are generally flat throughout the area. Ground-water flow is generally northeast toward Md. Rt. 450. (Note that the water levels in shallow piezometers next to GM-12, GM-13, GM-14, and GM-15 were employed in the water-level map because they best represent the actual water table. Such shallow piezometers are distinguished with the letter P, (i.e., GM-15 Well / GM-15P Water Level Piezometer.) Water-level gradients in the aquifer average less than 1.5 feet in elevation per 100 feet horizontal distance under the site. The saturated thickness is approximately 65 feet across the site (25 in the Aquia Formation and 40 in the Brightseat).

A schematic flow net along cross-section A-A' is shown in Figure 21. Note that Wells GM-2, GM-3, and GM-14 were projected onto the cross section. As shown in the figure, ground-water flow is predominately lateral in the uppermost aquifer. In the well cluster (GM-8, GM-9 and GM-10), water levels were nearly identical at each depth -- an indication of no significant vertical gradient. In the vicinity of Md. Rt. 450, flow becomes more vertical upward as it discharges to surface waters. As portrayed in this flow net, and consistent with water-quality data, ground water recharged in the source area (i.e., from dry wells) is restricted to the top portion of the uppermost aquifer. The bottom of this zone is indicated with the ground-water flow arrows.

Results of the short duration pumping tests are summarized in Table 10. The data sheets are provided in Appendix I. The mean estimated hydraulic conductivity of 1.32 ft/day is consistent with the vertical permeability test results on the Aquia Shelby tube samples (mean of 1.54

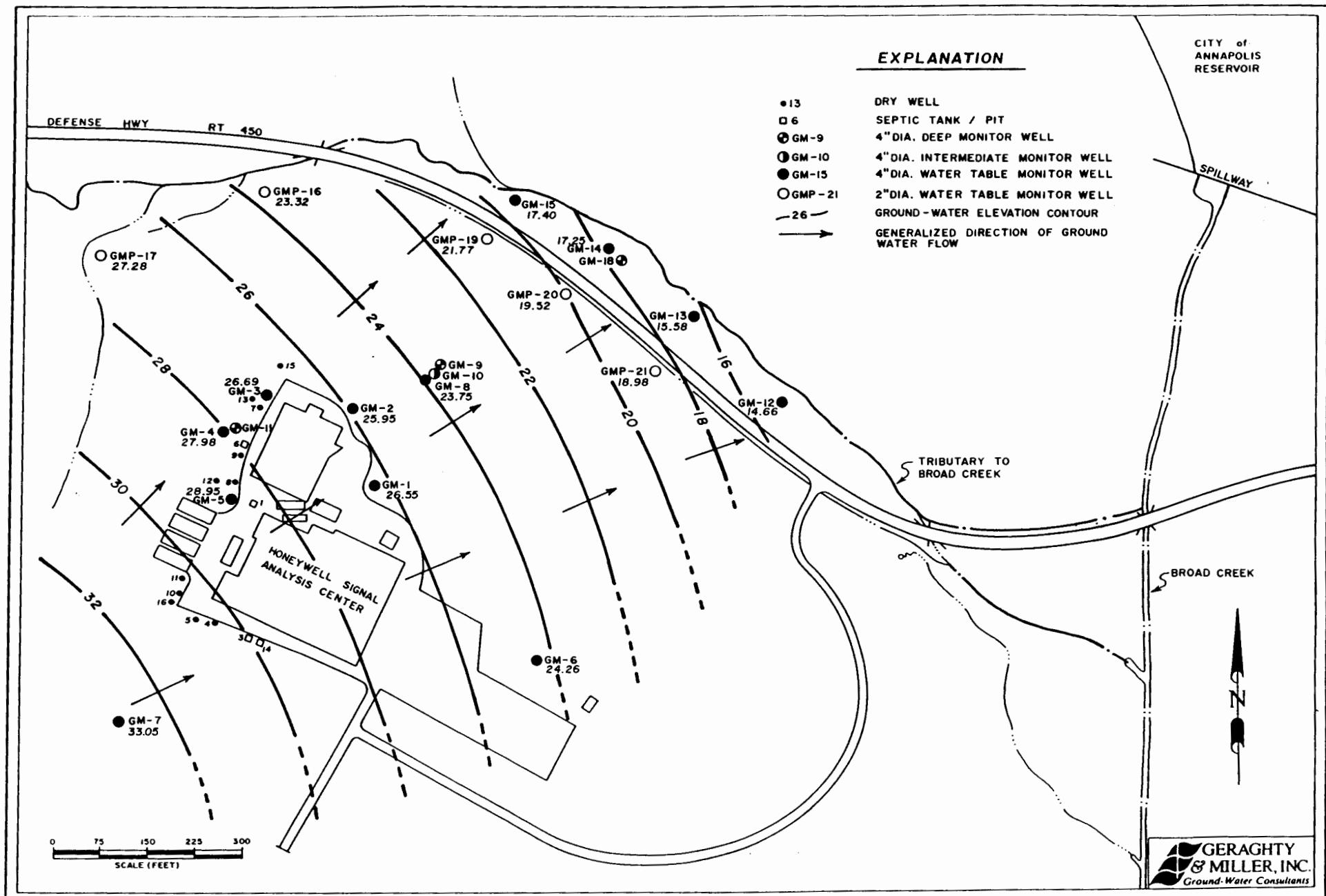


Figure 20. Water-Table Elevation Contour Map

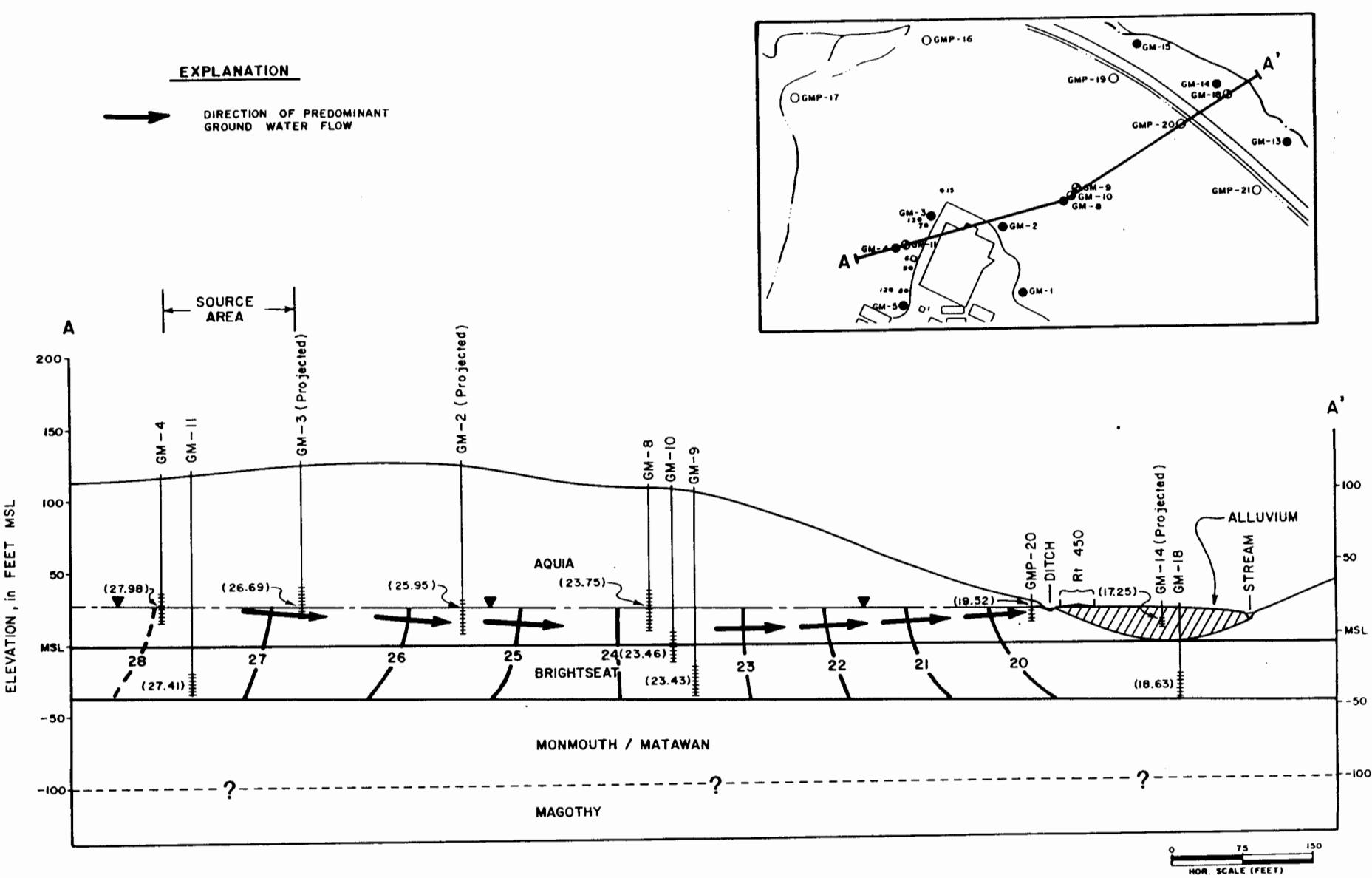


Figure 21. Schematic Flow Net Along Vertical Cross-Section A-A'

TABLE 10  
SUMMARY OF SHORT DURATION PUMP TEST RESULTS

<u>Well I.D.</u>	<u>Transmissivity*</u> <u>g/d/ft   ft<sup>2</sup>/d</u>		<u>Saturated Thickness</u> <u>While Pumping(ft)</u>	<u>K</u> <u>ft/d</u>
GMP 16	29.72	3.97	5.5	0.72
GMP 19	18.90	2.53	5.5	0.46
GMP 20	72.99	9.76	4.5	2.17
GMP 21	<u>72.04</u>	<u>9.63</u>	5	<u>1.93</u>
Mean	48.41	6.47		1.32

\* Transmissivity is for saturated thickness of screen interval

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ft/day). Usually, lateral hydraulic conductivity is larger than vertical hydraulic conductivity in sediments such as the Aquia Formation. It is likely that the short-duration pumping tests underestimate lateral hydraulic conductivity in the Aquia sediments.

Available information allows for a rough estimate of ground-water flow velocities and travel times. The velocity equation is as follows:

$$V = \frac{KI}{N}$$

Where:      V = Velocity  
                K = Hydraulic Conductivity  
                I = Hydraulic Gradient  
                N = Effective Porosity

The following estimates of parameters can be made for the Aquia Formation:

$$\begin{aligned} K &= 1.3 \text{ ft/day (table 10)} \\ I &= 0.0165 \\ N &= 0.46 \end{aligned}$$

The velocity calculation is:

$$\begin{aligned} V &= \frac{(1.3 \text{ ft/d}) (0.0165)}{0.46} \\ &= 4.7 \times 10^{-2} \text{ ft/day} \end{aligned}$$

Travel time can be calculated with the division of velocity into distance. Ground-water travel time from the vicinity of dry well DW-9 to the road-site ditch south of MD Rt. 450 is calculated as follows:

$$\frac{570 \text{ ft.}}{(4.7 \times 10^{-2} \text{ ft/day})} = 12,224 \text{ days or } 33.5 \text{ years}$$

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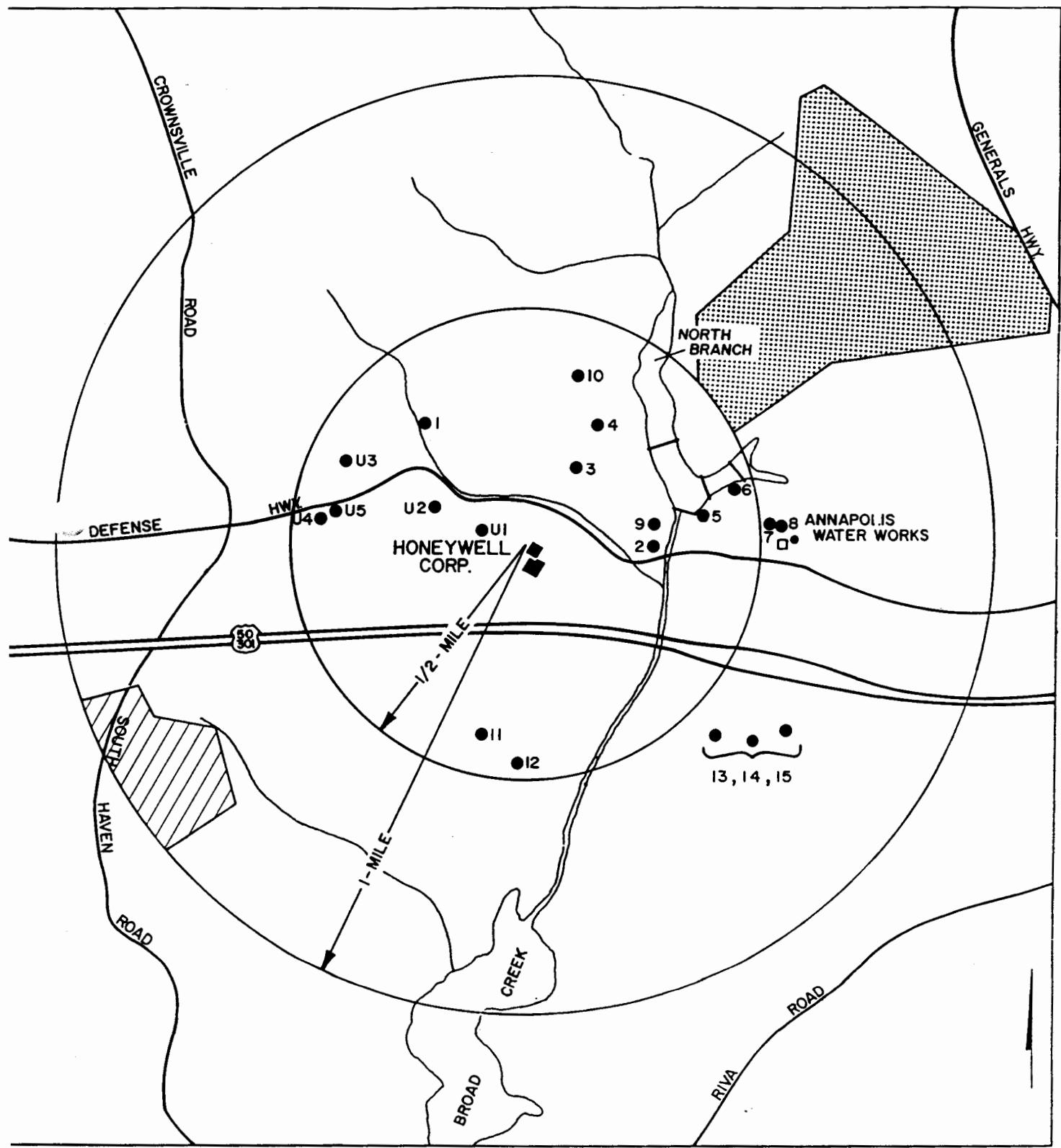
This estimate of travel time would suggest that ground waters originating in the source area may have only recently begun to discharge to the road-side ditch. The Honeywell facility was initiated in 1956, 32 years ago.

The 33.5 year travel time is likely to be an excessively large estimate due to underestimating of the hydraulic conductivity mentioned above and the nature of the porosity estimate. The porosity values listed on Table 10 represent total porosity and are conservative estimates. Effective porosity is likely to be less than 0.46; a value in the range of 0.2 to 0.3 is appropriate for fine sands. Using this range for effective porosity and a hydraulic conductivity of 2.6 ft/d, travel time would be reduced to between 7 to 11 years. G&M believes this range to be a more reasonable estimate of travel times.

Water-quality data suggest that the ditch along Md. Rt. 450 may be a major discharge area during the seasonal period of higher water levels. G&M believes that ground-water discharge into the stream on the northern side of Rt. 450 also occurs, particularly during periods of low water levels. Mini-piezometer water levels were observed for vertical head measurements to determine if the water bodies were gaining or losing. Evidence suggests that the road ditch south of Md. Rt. 450 gains between GMP-19 and the Honeywell entrance, while the stream gains sporadically along a parallel segment of length.

### 4.3.4 Well Survey

G&M conducted a one-mile radius well survey in the vicinity of the Honeywell facility. Well locations are shown on Figure 22. A summary of well characteristics is provided in Table 11. Two public water-supply well fields exist



#### EXPLANATION

- PERMITTED WELL
- U UNPERMITTED WELL
- ▨ AREA OF DOMESTIC WELL USE
- ▨ AREA OF ABANDONED DOMESTIC WELLS

Figure 22. Location of Water Supply Wells in the Vicinity of the Honeywell Facility.

TABLE 11.  
Summary of Drinking Water Supply Well Characteristics

G&M Map ID Code	MD State Well Permit Number	Owner	Use	Estimated Pumpage (APD)	Screen Depth or Interval (Feet)	Aquifer
2	No Permit	Annapolis Well #2	Public	*	147-252	Magothy
5	AA001628	Annapolis Well #5	Public	*	199-249	Magothy
6	AA001627	Annapolis Well #6	Public	*	192-242	Magothy
7	AA17076	Annapolis Well #7	Public	*	287-347	Magothy
8	AA650822	Annapolis Well #8	Public	1,800,000	907-1040	Lower Patapsco
9	AA813643	Annapolis Well #9	Public	1,440,000	790-1090	Patapsco
10	AA810951	Annapolis Landfill	Industrial	500	132	Aquia
11	AA811162	Donald Semesky	Domestic	500	225-235	Magothy
12	AA814709	Sunshine Homes	Domestic	300	108-117	Aquia
13	AA680188	A.A. Co. Dept. of Utilities	Public	875,000	492	Magothy/ Patapsco?
14	AA680189	A.A. Co. Dept. of Utilities	Public	875,000	563	Patapsco
15	?	A.A. Co. Dept. of Utilities	Public	1,000	?	?
U-1	No Permit**		Domestic	300		Aquia(?)
U-2	No Permit**		Domestic	300		Aquia(?)
U-3	No Permit**		Domestic	300		Aquia(?)
U-4	No Permit**		Domestic	300		Aquia(?)
U-5	No Permit**		Domestic	300		Aquia(?)

\* Combined pumpage of Annapolis Magothy wells = 2.5 mgd

\*\* Unpermitted wells are probably screened in Aquia, but no records exist

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within the area. One belongs to the City of Annapolis and contains six wells (2, 5, 6, 7, 8 and 9) which are screened in the Magothy and Patapsco Formations. The second contains three wells (13, 14, and 15) screened in the Magothy and Patapsco Formations belonging to the Anne Arundel County Department of Utilities (previously belonged to A.A. Co. Dept. of Public Works prior to 1987). Within a one-mile radius, two subdivisions with individual wells for domestic use exist. The northeastern one (Rolling Knolls Subdivision) has been supplied with city water. The southwestern subdivision, however, still uses the individual domestic wells. Both areas are indicated on Figure 22.

Seven domestic wells (11, 12 and U-series) are located within one-half mile of the Honeywell facility. Most of these wells were not permitted.

The City of Annapolis landfill maintains several observation wells not shown on Figure 22. One industrial well (No. 10) exists at the landfill, however, and is shown.

## 4.4 Ground-Water Quality

### 4.4.1 Drinking Water Supplies

Public drinking-water supplies (i.e., wells) were sampled as part of Task 1 and analyzed for Suites A and C. Results of the analysis show that sampled public water supplies were free of Suite A volatile organic compounds (See Appendix A.2, Tables A.2.1 and A.2.2). All other constituents were below drinking-water standards.

The State of Maryland Department of Environment (MDE) sampled private sources of drinking water (i.e., wells) within one-half mile of the Honeywell facility. Specific

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information concerning the results of sampling of the private wells should be available from MDE. Information provided to G&M shows no VOCs in the private well waters.

#### 4.4.2 Monitoring Well Water

Organic and inorganic test results from well water sampling events are summarized in Appendix A.3, Tables A.3.1, A.3.2, A.3.3 and A.3.4.

A total of seven different VOCs were detected in monitoring-well water samples taken from monitoring wells screened in the Aquia formation. The compounds present included; DCE, DCA, TCA, TCE, bromoform, PCE and toluene. Toluene was only found in GMP-19 at 7 ug/L. Elevated levels of other mentioned VOCs were primarily found in wells; GM-1, GM-2, GM-3, GM-4, GM-5, GM-8, GMP-19, GMP-20, and GMP-21. Concentration ranges were as follows:

- DCE ----- 24 to 2,400 ug/L
- DCA ----- 2 to 54 ug/L
- TCA ----- 2 to 11,000 ug/L
- TCE ----- 2 to 42,000 ug/L
- PCE ----- 6 to 2,600 ug/L
- Bromoform ---- 13 to 200 ug/L.

Figures 23, 24, 25, and 26 show the approximate extent of the 100 ug/L concentrations of trichlorothene, 1,1,1-trichloroethane, 1,1-dichloroethene and tetrachloroethene, respectively in the Aquia portion of the uppermost aquifer.

Except for water samples from GM-11, the intermediate well (GM-10) and deep wells (GM-9 and GM-18) yielded waters essentially without detectable VOCs. Post development waters and the replicate of the following round of sampling (referred to as first round of sampling) showed traces of TCE, 3 to 6 ug/l in GM-10.

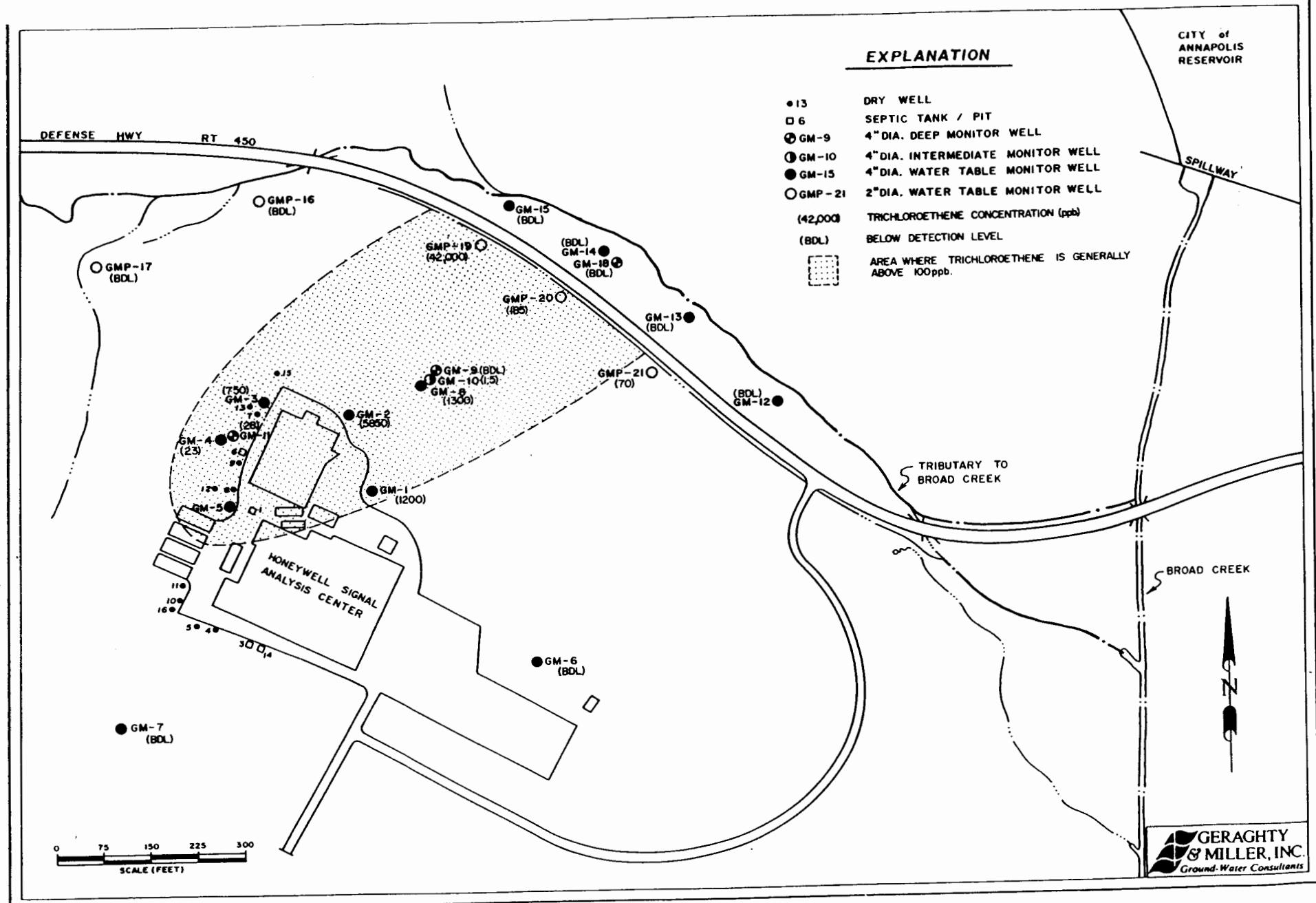


Figure 23. Distribution of Trichloroethene in the Uppermost Aquifer

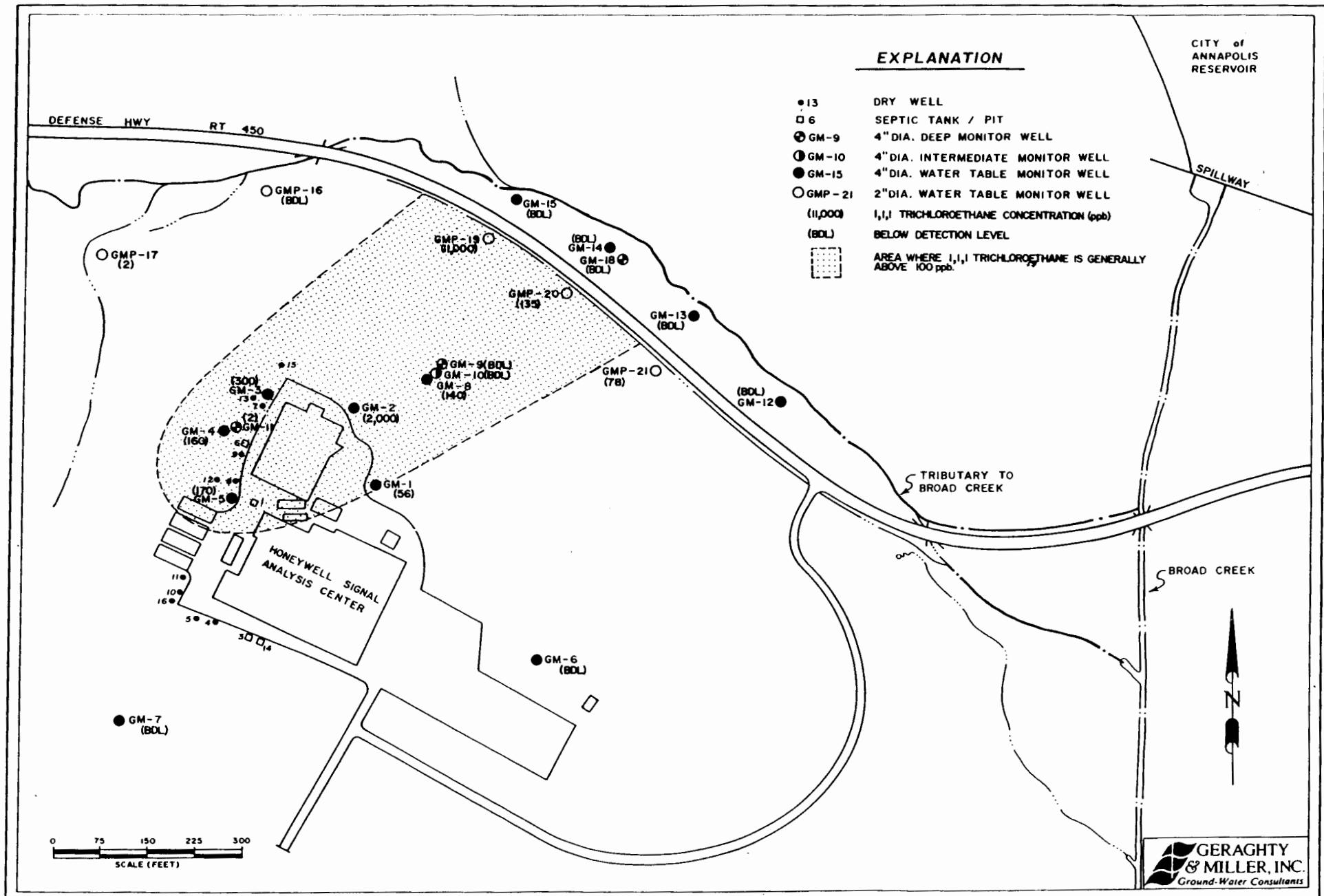


Figure 24. Distribution of 1,1,1 - Trichloroethane in the Uppermost Aquifer

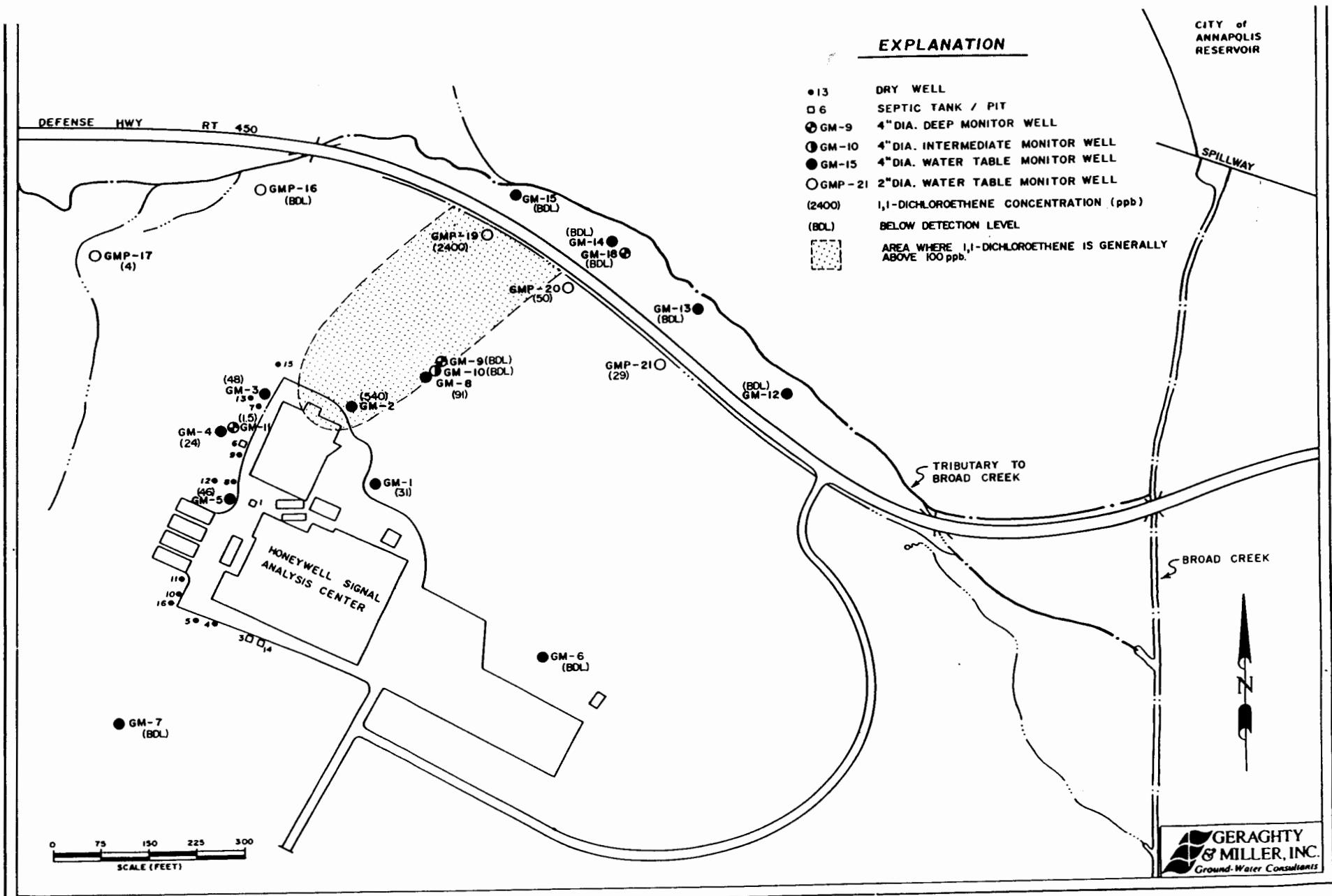


Figure 25. Distribution of 1,1 - Dichloroethene in the Uppermost Aquifer

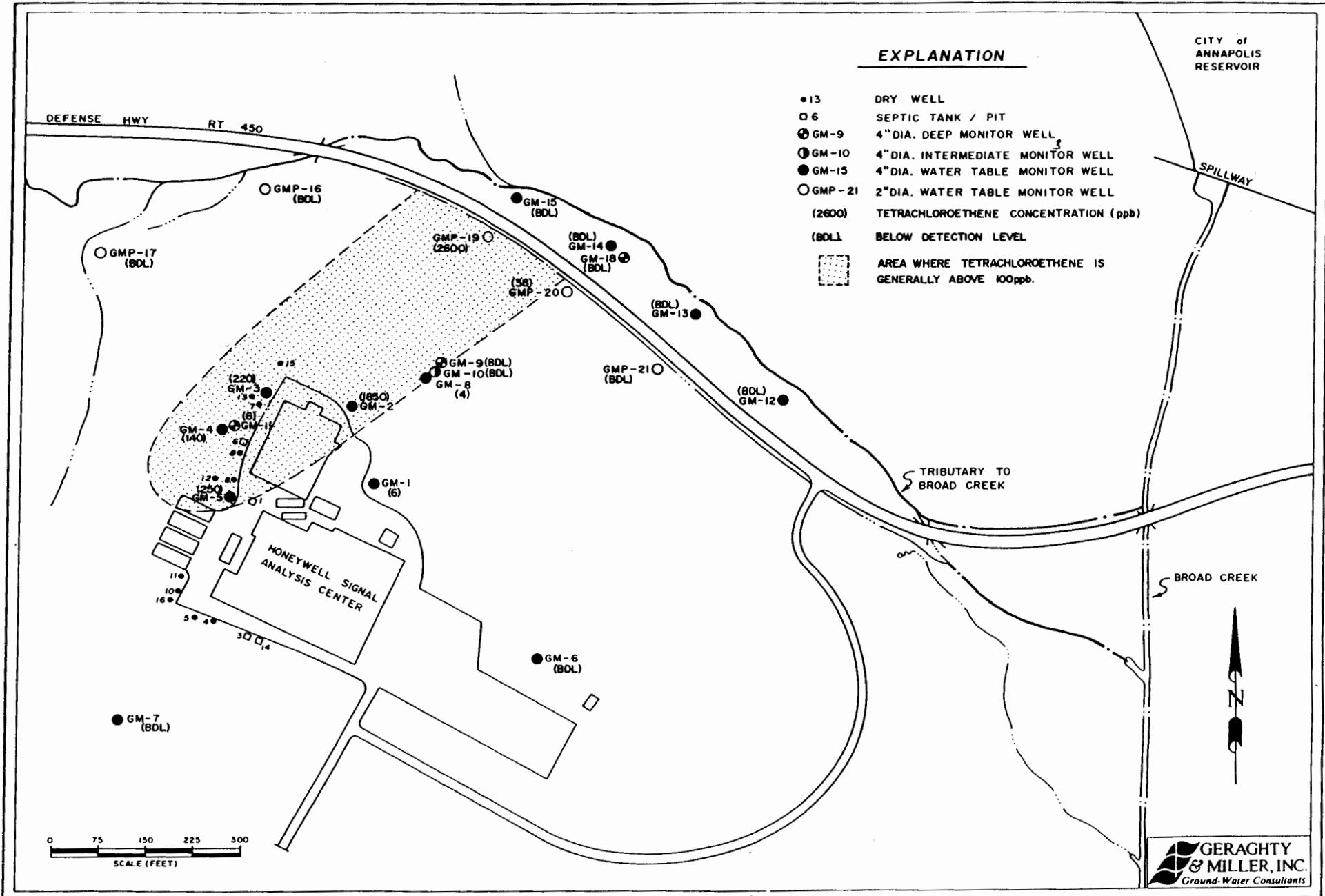


Figure 26. Distribution of tetrachloroethene in the Uppermost Aquifer

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In GM-11 waters, four VOC compounds were detected in post development water samples (1,1,1-Trichloroethane, 1,1-Dichlorothane, Tetrachlorothene and Trichloroethene) at a total of 43 ug/l. In the following full round of sampling, only two VOC compounds (Trichloroethene, and Tetrachloroethene) were detected at a total of 34 ug/l.

GM-11, an extremely low yielding well, may not be fully developed. It is possible that these VOC concentrations are a result of well installation through the Aquia sediments. The mud and waters carried down as part of drilling and well construction may not have been fully removed and are acting as a low level source. If so, subsequent samples should show a trend of reduced concentration until reaching non-detectable levels.

Low concentrations of total metals were found in the majority of the well waters. Specific metals identified include; arsenic, chromium, copper, nickel, lead and zinc. With the exception of chromium, all quantified metals were at, or just above, Federal drinking water standards. Chromium concentrations range between 0.03 and 0.49 mg/L. As explained in the following section, these high levels are, in G&M's opinion, an artifact of sampling.

### 4.4.3 Suspended Solids Relationship to Chromium Concentrations

Chromium concentrations appear to exceed drinking water standards in unfiltered water samples from wells screened in the Aquia Formation. However, a regression analysis of suspended solids to chromium concentrations shows a direct relationship that indicates that most of the chromium is not actually dissolved in the water. Figure 27 shows a plot of suspended solids versus chromium concentrations and the

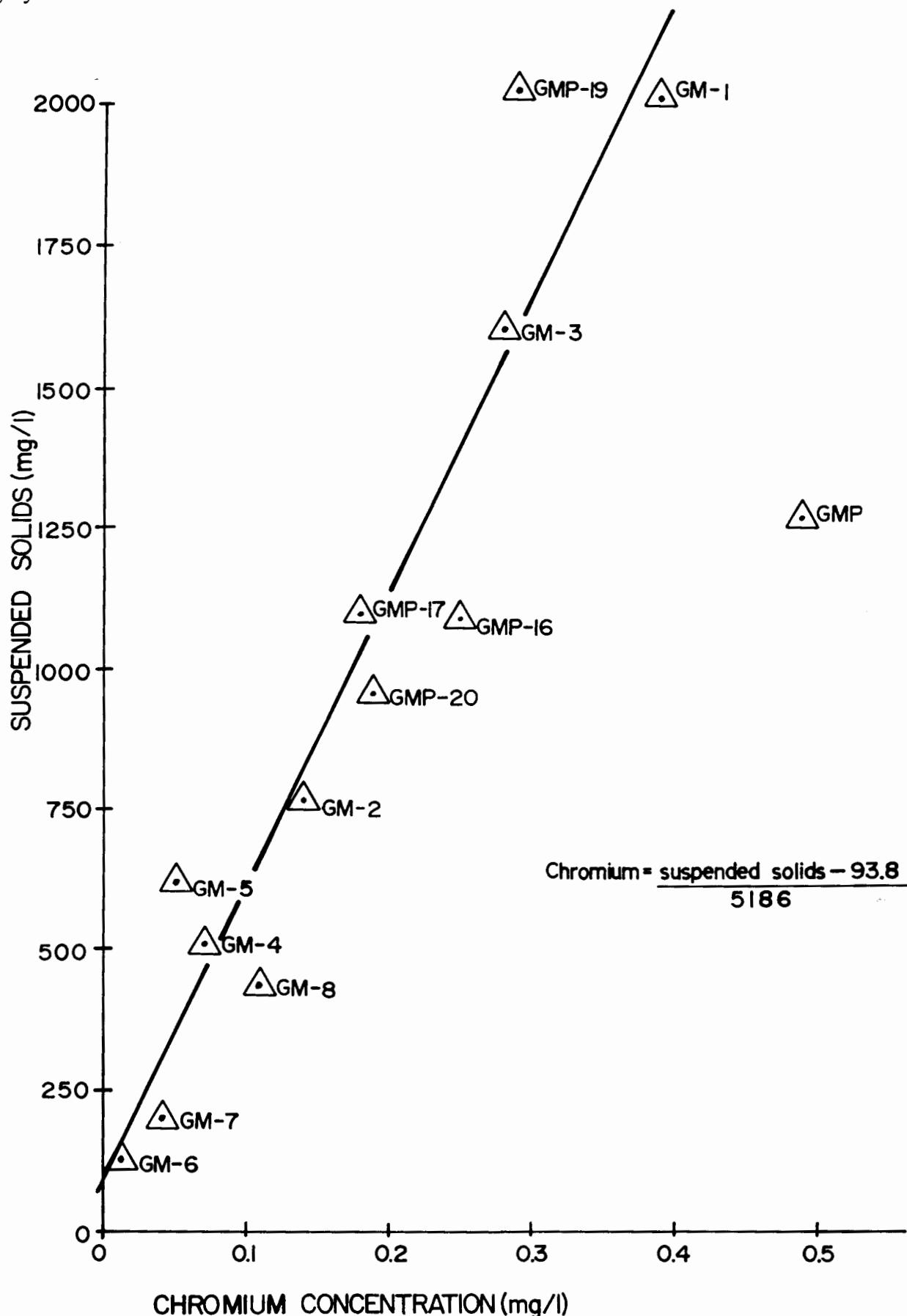


Figure 27. Suspended Solids Relationship to Chromium Concentrations in Aquia Formation Water Samples

linear relationship between the two for the March 28, 29, 30 sampling event.

Aquia Formation sediments are naturally high in chromium as is discussed in section 4.6. Because of the high fine sand content of these materials (in the range of 50 percent-- see Section 4.3) monitoring-well water tends to be high in suspended solids concentrations. In a drinking-water well system, the suspended solids would typically be very low as a result of extensive well development and pumping. In water from monitoring wells, chromium is released to sample waters from sediment found in a given sample as a result of standard nitric acid preservation. As shown in Figure 27, the higher the suspended solids concentration, the higher the chromium concentrations.

G&M concludes that the chromium concentrations in unfiltered samples do not reflect true ground-water quality, but, rather are an artifact of sampling and preservation. Filtered samples consistently have non-detectable concentrations of chromium. Chromium is present only when suspended solids are present. The acid preservative acts to strip the natural chromium from the suspended solids.

#### 4.5 Surface-Water Quality

Surface-water conditions for two water bodies in the vicinity of Md. Rt. 450 were evaluated as part of Task 2.

##### 4.5.1 Stream and Mini-Piezometer Water

The stream north of Md. Rt. 450 was sampled using mini-piezometers and grab samples as described in Section 3.2 at locations shown in Figure 3. A summary of both organic and inorganic constituent analyses can be found in Appendix A.4,

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Tables A.4.1 and A.4.2. Organic and inorganic chemical analyses performed on water samples collected from the tributary to Broad Creek flowing North of Md. Rt. 450 indicate localized, low part-per-billion (ppb) concentrations of five low molecular weight volatile organic compounds (VOCs); 1,1,1-trichloroethane (TCA), 1,1-dichloroethane (DCA), 1,1-dichloroethene (DCE), trichloroethene (TCE), and tetrachloroethene (PCE). No elevated levels of Suite C metals were detected.

Solvent concentrations peak at 6 ppb in the vicinity of sampling location S-5, a probable discharge area for VOC-contaminated ground waters during low flow conditions. Concentrations diminish, in part due to volatilization and dilution, to levels that are below detection limits for all compounds at downstream sampling location S-3.

Chemical analyses performed on ground water collected from mini-piezometers placed in the stream bed only showed low concentrations of the same five VOCs at stream-piezometer location MP-8. Concentrations for the above mentioned VOCs at this location ranged from 2 to 230 ppb. All other mini-piezometer sampling locations had VOC concentrations below detection limits. Inorganic water quality for stream-piezometer water was found to be normal at all locations with no elevated metal concentrations.

### 4.5.2 Road-Side Ditch Water

Water samples collected from the ditch (D-16, D-18, D-20, D-22, D-24, D-26 and D-27) on the south side of MD Rt 450 were analyzed for VOCs (Suite A). Results from those analyses are summarized in Appendix A.4 Table A.4.3.

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VOCs that were present in the ditch water include; TCA, DCA, DCE, PCE, TCE and vinyl chloride. Concentrations were highest at D-27 and decreased at down-ditch sampling stations. TCA, DCE and TCE appeared in all sampling locations and ranged in concentrations from 10 to 2,300 ppb, 1 to 920 ppb and 32 to 5,700 ppb, respectively. DCA was found in water samples D-22, D-24, D-26 and D-27 varying between 5 and 69 ppb. PCE was detected between sampling locations D-20 and D-27. Concentrations for the compound ranged between 4 and 540 ppb. Vinyl chloride only appeared in water from location D-26, at a concentration of 21 ppb.

### 4.6 Soil Conditions

Soil samples from septic tank/pit borings, dry-well borings and isopropanol area borings were analyzed for constituents listed in Suites C, D, and E. Background soil boring samples were only analyzed for Suite C metals.

#### 4.6.1 Soils Adjacent to Septic Tanks/Pit

Analytical results from the borings next to the septic tanks/pit are summarized in Appendix A.5 Tables A.5.1 and A.5.2. TCE and PCE were evident in a few of the septic borings, however, their concentrations were within five times the detection limits in all circumstances.

Soil samples from borings located next to septic tanks/pit showed no detectable concentrations of acid or base/neutral extractable priority pollutants.

Acid digestion for total metals on the same septic boring samples as above revealed elevated levels of three metals; barium, chromium and lead. EP Tox data for the same

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samples (Table A.1.3) showed no concentrations above RCRA limits that would define them as a hazardous waste.

## 4.6.2 Dry-Well Borings

Chemical results from the organic and inorganic analyses of the twelve dry-well borings (DWB-4, DWB-5, DWB-7, DWB-8, DWB-9D, DWB-9U, DWB-10, DWB-11, DWB-12, DWB-13, DWB-15 and DWB-16) are summarized in Appendix A.5, Tables A.5.3 and A.5.4.

VOC results showed scattered low-level concentrations of only two compounds; TCE and PCE. Concentrations range from 5.9 to 390 ppb for TCE and from 6 to 150 ppb for PCE. Levels were generally within five times the detection limits. Methylene chloride was present as a laboratory contaminant in the majority of the samples.

Soil samples from borings located next to the dry wells showed no concentrations of acid or base/neutral extractable priority pollutants.

Metal analyses using the acid digestion extraction method showed elevated concentrations of chromium, lead, and barium in several of the dry-well borings. Concentration ranges for total barium were from 50 ppm (detection limit) to 420 ppm. Total chromium concentrations were between 11 ppm and 168 ppm. Total lead concentrations ranged from 1 ppm to 124 ppm.

EP Tox metal analyses were run on selected dry-well boring samples and are summarized in Table A.1.3. Metals that were at concentrations above detection levels include chromium, copper, and zinc. Chromium was only found in dry-

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well borings DWB-9U and DWB-9D with levels that ranged from 0.01 to 0.46 ppm. Copper was found in two dry-well borings, DWB-7 and DWB-9D at 0.01 ppm and 0.02 ppm, respectively. Low levels of zinc were found in all dry-well samples analyzed using the EP Tox methodology. Zinc concentration ranges were between 0.01 and 0.23 ppm. Although these EP TOX extractable metals were present, they do not exceed concentrations used by RCRA to define hazardous waste.

### 4.6.3 Isopropanol Disposal Area Borings

Organic and inorganic analytical results from soil samples taken in the isopropanol disposal area are summarized in Appendix A.7, Tables A.7.1 and A.7.2.

A total of four different VOCs were identified at low levels in the soil boring samples (TCA, TCE, PCE and 1,1,2-trichloropropene). TCA appeared at all depths in the two borings and had concentrations ranging from 5 to 48 ppb. TCE was found at varying depths in both borings at concentrations ranging between 16 and 22 ppb. PCE and 1,1,2-trichloropropene were found randomly at concentrations within 2 times the detection limits (5 ppb).

Acid digestion extraction procedures for metals detected the presence of eight metals (arsenic, barium, chromium, copper, mercury, nickel, lead and zinc). Primary constituents include arsenic (4 to 20 ppm), chromium (17 to 56 ppm) and lead (8 to 130 ppm). Other metals mentioned were at concentrations at or very close to the detection limits.

EP TOX metal analysis showed levels at or below detection limits (see Table A.1.3).

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### 4.6.4 Screen Interval Soils

Results from analytical tests run on soil samples from the monitoring well screen interval are summarized in Appendix A.8, Tables A.8.1 and A.8.2.

A total of six different VOCs were detected at low concentrations in several of the samples (TCA, ethyl benzene, methylene chloride, TCE, toluene and xylenes (o-, m-, p-). Concentrations were generally within 10 times the detection limits. Compounds that were most prominent include TCE (4 to 32 ppb), toluene (5 to 12 ppb) and methylene chloride (1 to 3 ppb).

Inorganic analyses for total metals detected a total of six different metals (chromium, copper, nickel, lead, selenium and zinc). Concentrations for chromium and lead were slightly elevated and varied between 6 and 51 ppm for chromium while lead varied between 2 and 16 ppm. Other detected metals had concentrations similar to background levels.

### 4.6.5 Background Soil Borings

Background soil samples from the Aquia Formation show varying concentrations of barium, chromium, copper, nickel, lead and zinc as listed in Appendix A.6, Table A.6.1. Barium and copper appear to be concentrated in the upper 10 to 20 feet of soils on the hilltop. Concentrations for barium, determined by acid extraction methods, are as high as 210 ppm. Natural total chromium levels average approximately 70 ppm and fluctuate between 10 and 135 ppm. The highest natural chromium levels are found at a depth range between 25 and 55 feet. Natural lead concentrations, as determined by

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acid extraction, average 7 ppm and vary within the narrow range of 4 to 11 ppm. The natural lead appears generally at a soil depth between 25 and 70 feet. Zinc concentrations average approximately 25 ppm and appear to increase with a corresponding increase in soil depth.

G&M believes, in general, that the acid digestion extractable metal concentrations found in the soil borings across the site, whether next to a dry well or septic tanks or not, reflect background conditions for the most part. Figure 28 shows a compilation of barium concentrations with depth for all borings (note that the detection limit is 50 ppm (mg/kg)). The overall pattern is for the highest concentrations to occur within 25 feet of the surface. Below 60 feet msl, Barium concentrations are generally below detection limits. Chromium concentrations with depth across all soil borings also show a distinctive pattern (see Figure 29). Chromium increases with depth to elevation 80 to 90 feet msl, then decreases. Since only one wastewater stream had significant levels of either metal, it is unlikely that these patterns would have resulted from their disposal by Honeywell.

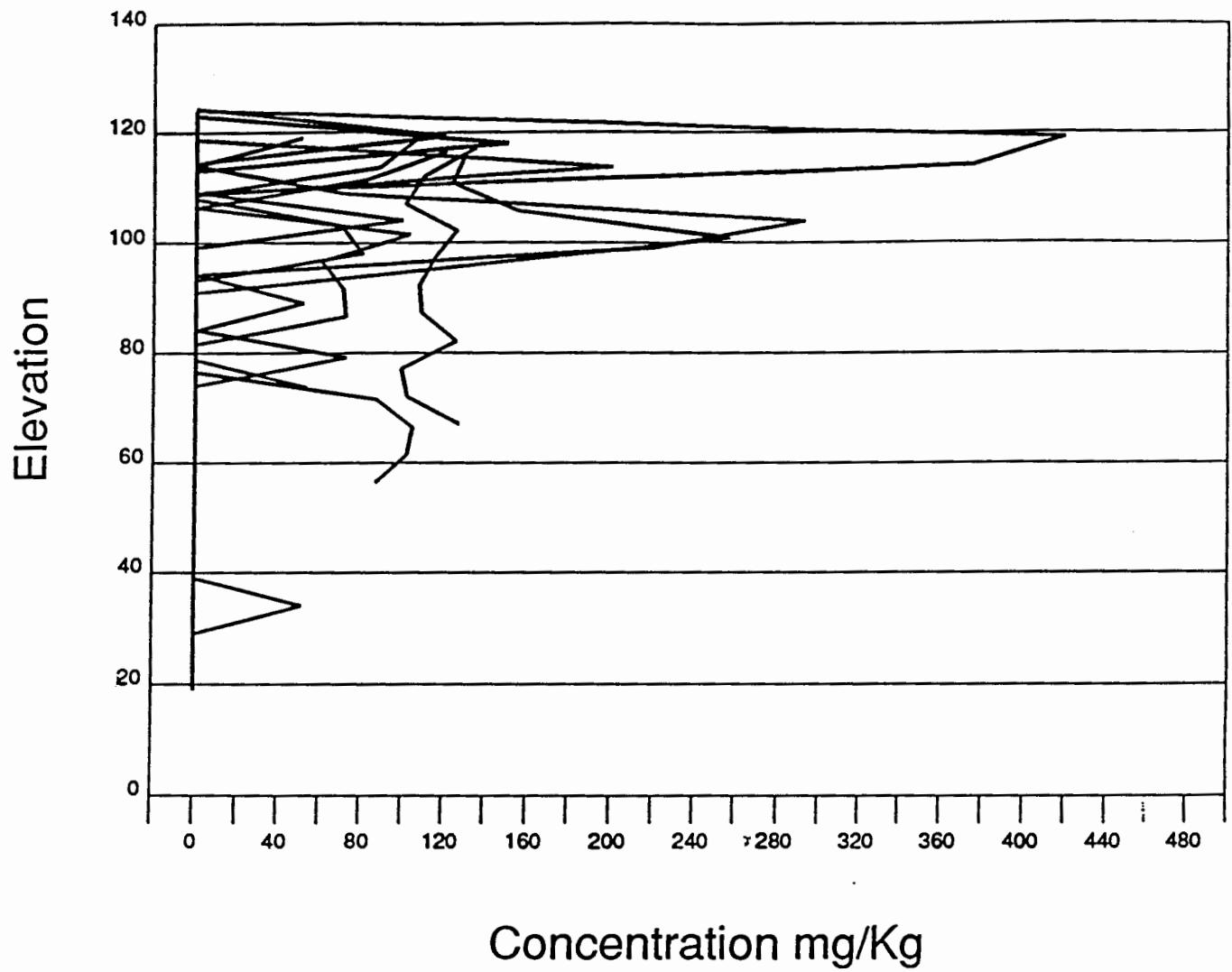


Figure 28. Barium Concentrations with Depth  
in all Borings

(0 = below detection limits)

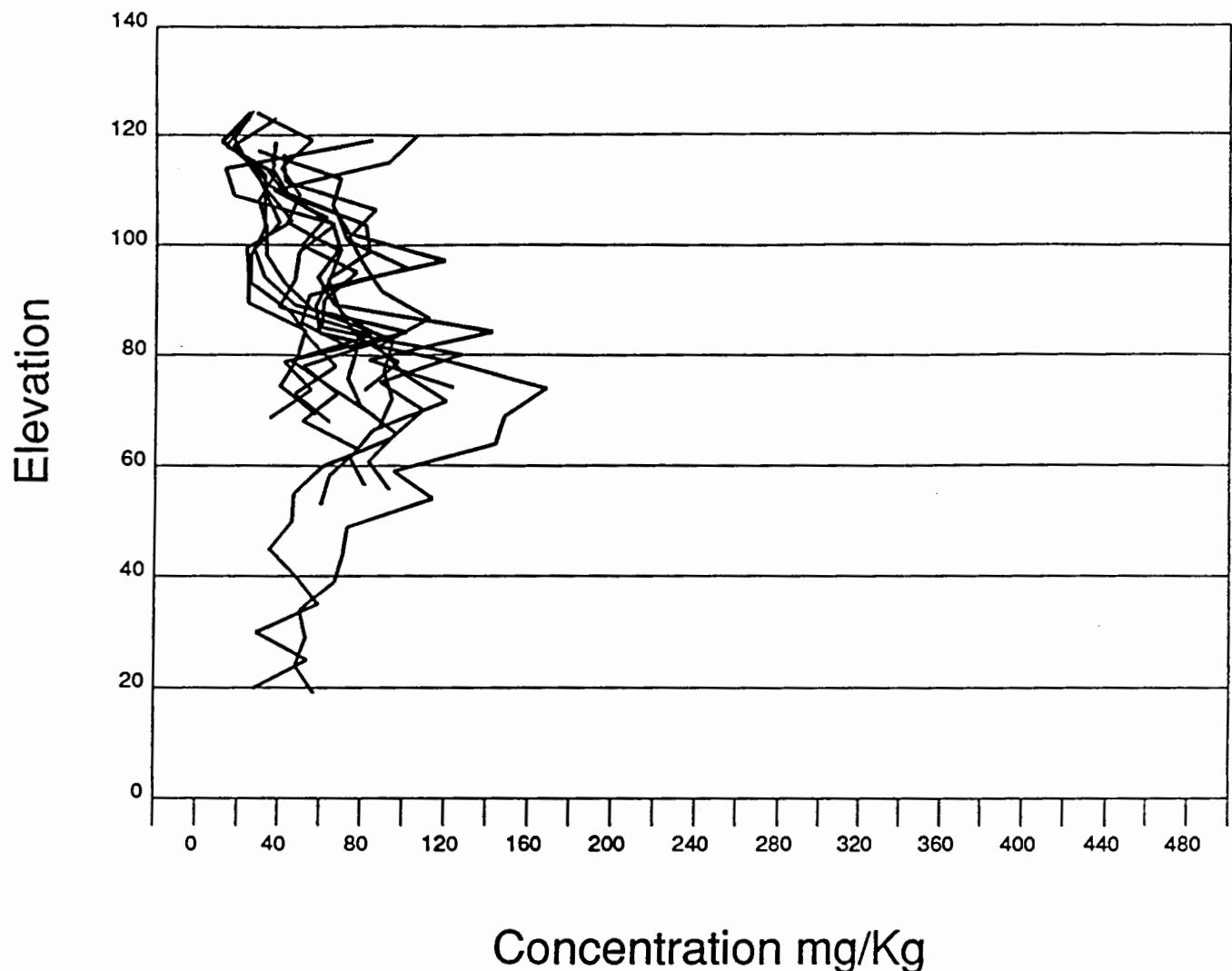


Figure 29. Chromium Concentrations with Depth  
in all Borings  
(0 = below detection limits)

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## 5.0 SORPTION STUDY

Geraghty & Miller, Inc. (G&M) subcontracted Biospherics, Inc., of Beltsville, Maryland, to conduct a sorption study on the soils of the Aquia Formation. This Chapter provides an overview of the study and related analysis. The Biospherics report can be found in Appendix D. The objective of this study was to determine the chromium sorption characteristics of the unconsolidated, unsaturated soil material beneath Dry Well DW-9. The State of Maryland is concerned that chromium discharged in Dry Well DW-9 may eventually leach to the ground water and migrate off site. The sorption study was designed to determine the maximum sorption capacity of these materials as well as the degree to which chromium is irreversibly sorbed into the soil.

### 5.1 Study Components

Soil samples collected in the interval 70.0 feet to 88.0 feet in DWB-9D were blended into a composite sample. This soil interval is immediately above the water table and below the zone of highest acid digestion extractable chromium levels in this boring.

The sorption study involved contacting aliquots of the composite soil sample with 40 ml solutions of varying concentrations of chromium. The chromium solutions were prepared using sodium chromate tetrahydrate ( $\text{Na}_2\text{CrO}_4 \cdot 4\text{H}_2\text{O}$ ), the same chemical used in the plating baths at Honeywell. This compound dissociates to release  $\text{CrO}_4^{2-}$ , hexavalent chromium. Hexavalent chromium was detected at low concentrations (less than 2.3 mg/kg) in soil samples from borings DW9-D and DW9-U at depths of 29 to 59 feet and 45 to 55 feet respectively. An equilibration test was performed to determine the kinetics of chromium sorption on these samples.

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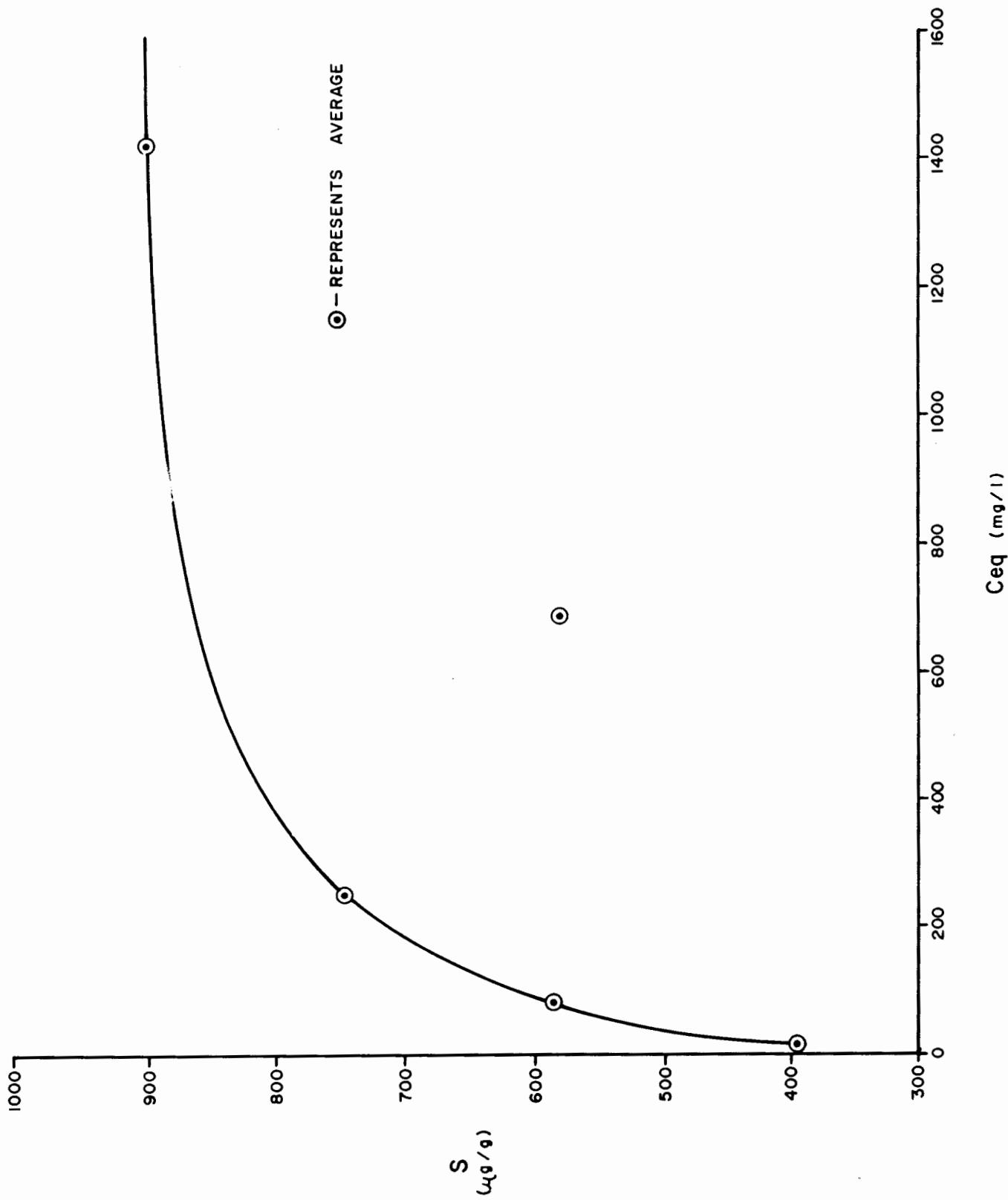
A 10 ppm chromium solution was contacted with soil samples for 6, 24, 30 and 48 hours. It was found that all of the chromium was sorbed within the first 6 hours. Based on this analysis, it was decided that the chromium-sorption testing would be conducted using a 24-hour contact period.

The multi-level test was run on eight gram aliquots of the soil at five different chromium concentrations (100 ppm, 200 ppm, 400 ppm, 800 ppm and 1600 ppm). In order to maintain a constant ionic strength across these varying concentrations, a 0.01M NaCl solution was used for preparing the solutions of varying chromium concentrations.

In order to determine the magnitude of irreversible chromium sorption, a desorption test was conducted using a 1 M.KCL solution with a 24-hour contact time. Note that all the multi-level testing and desorption testing was conducted in triplicate.

## 5.2 Results

Table 12 shows the results of the multi-level testing. Averages are listed for each of the five initial chromium concentrations. Figure 30 shows a plot of the data collected as soil chromium concentration (ug/g) versus the equilibrium solution concentration (mg/l). For some unknown reason, the initial 800 mg/l chromium solution tests resulted in a lower sorption density than that for the 400 mg/l initial solution tests. It is assumed that the data set for the initial 800 mg/l solution is invalid. One possible explanation for this apparent anomaly could be that a variation in iron oxide content existed in the soil samples that were tested. It appears from the plot that the maximum sorption capacity of the soil was approached when the soil was equilibrated with the 1600 mg/l solution of chromium.



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This data can be used to calculate the distribution coefficient, ( $K_d$ ).  $K_d$  is defined as the ratio between the concentration of chromium sorbed onto the soil, ( $S$ ), and the concentration of chromium in the solution, ( $C$ ). This is expressed mathematically by the following equation:

$$K_d = S/C$$

Table 12 presents the values for  $K_d$  for the average of each of the five sets of sorption data.

The distribution coefficient can be used to calculate the retardation factor, ( $R_d$ ), which affects the rate of constituent migration. The retardation factor is defined as the ratio between the velocity of ground water and the velocity of the constituent, and can be expressed using the following equation:

$$R_d = 1 + K_d p/n = V_w/V_c$$

where:       $p$  = the bulk density of the soil  
                 $n$  = the porosity of the soil  
                 $V_w$  = the velocity of ground water  
                 $V_c$  = the velocity of the constituent.

The retardation factor can be calculated by assuming values for  $p$  and  $n$ . The porosity of several samples from the Aquia formation was measured in the laboratory, and a value 0.45 appears to be a reasonable estimate for the porosity of these soils. A value of 1.8 g/cc is a reasonable estimate for bulk density. The retardation factor for each set of sorption data was calculated using these estimated values for porosity and bulk density, and is presented in Table 12.

TABLE 12. CHROMIUM SORPTION RESULTS

Initial (Cin) (mg/l)	Solution Equilibrium (Ceq) (mg/l)	Soils (S) (ug Cr/g soil)	Kd (S/Ceq)	Rd*
100	21	397	19	77
200	83	585	7.0	29
400	251	745	2.9	13
800	684	580	0.84	4.4
1600	1419	903	0.64	3.6

\* Rd calculated using the assumed values of 0.45 for soil porosity and 1.8 for soil bulk density

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Review of these calculated values indicates that the migration of chromium in these soils should be greatly retarded, even at the relatively high concentrations of chromium that were used for the sorption tests. The general observed trend is that as equilibrium soil and solution concentrations increase, the retardation of constituent migration decreases. Rigorous acid digestion and analyses of these soils indicate that the chromium levels which are currently present at the Honeywell site are significantly lower (less than 75 ug/g) than the conditions used for the sorption test. Therefore, the effective retardation factor for chromium migration at the site is likely to be greater than 77 (the highest calculated for Rd).

Several empirical relationships have been developed to evaluate sorption isotherm data. The Langmuir model allows for calculating the maximum sorption capacity, and can be expressed using the following equation:

$$S = \frac{K_L A_M C}{1 + K_L C}$$

Where  $S$  = Moles (or ug) adsorbed at equilibrium per gram of soil

$A_M$  = The maximum sorption capacity of the soil

$K_L$  = The Langmuir adsorption constant which can be related to the binding energy of the adsorbate, and

$C$  = Total adsorbate concentration in solution at equilibrium

The use of this isotherm assumes that 1) adsorption occurs at specific sites with no electrostatic or chemical interactions between sorbate ions, 2) all sorption sites are

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equivalent (i.e., for a given sorbate, the binding energy for all surface sites is the same), 3) the ability of a sorbate ion to bind to a surface site is independent of whether or not the neighboring sites are occupied (i.e., the binding energy is independent of the sorption density), and 4) maximum sorption is limited to a monolayer coverage of the surface sites; that is, adsorption does not occur on the new surface layer formed by the adsorbate. The Langmuir isothermic equation listed above can be rearranged into the following equation:

$$c/s = 1/K_L A_M + C/A_M$$

The valid use of the Langmuir equation requires a linear plot of  $C/S$  versus  $C$ . The slope of this line,  $1/A_M$ , is the inverse of the sorption maximum. The y-intercept of this line is equal to  $1/K_L A_M$ .

A Langmuir plot of the multi-level sorption study test is shown in Figure 31. Note that two lines were drawn. One line accounts for all data points from the five different initial chromium concentration levels. A second line was drawn based on data exclusive of the initial 800 ppm chromium solution results. Note that the lines have similar slopes. The equation of the line for all points shows a slope of 0.001196 and y intercept of 0.091. The correlation of the data with this line has an  $R^2$  value of 0.88. The chromium sorption maximum, that is the inverse of the slope, is equal to 836 ug Cr/g soil. This value compares well with the observed sorption maximum of approximately 900 ug/Cr/g soil. (See Figure 30).

The desorption study was conducted on the triplicate soil samples of the 400 ppm chromium solution tests. Results indicate less than 10 percent of the chromium was desorbed

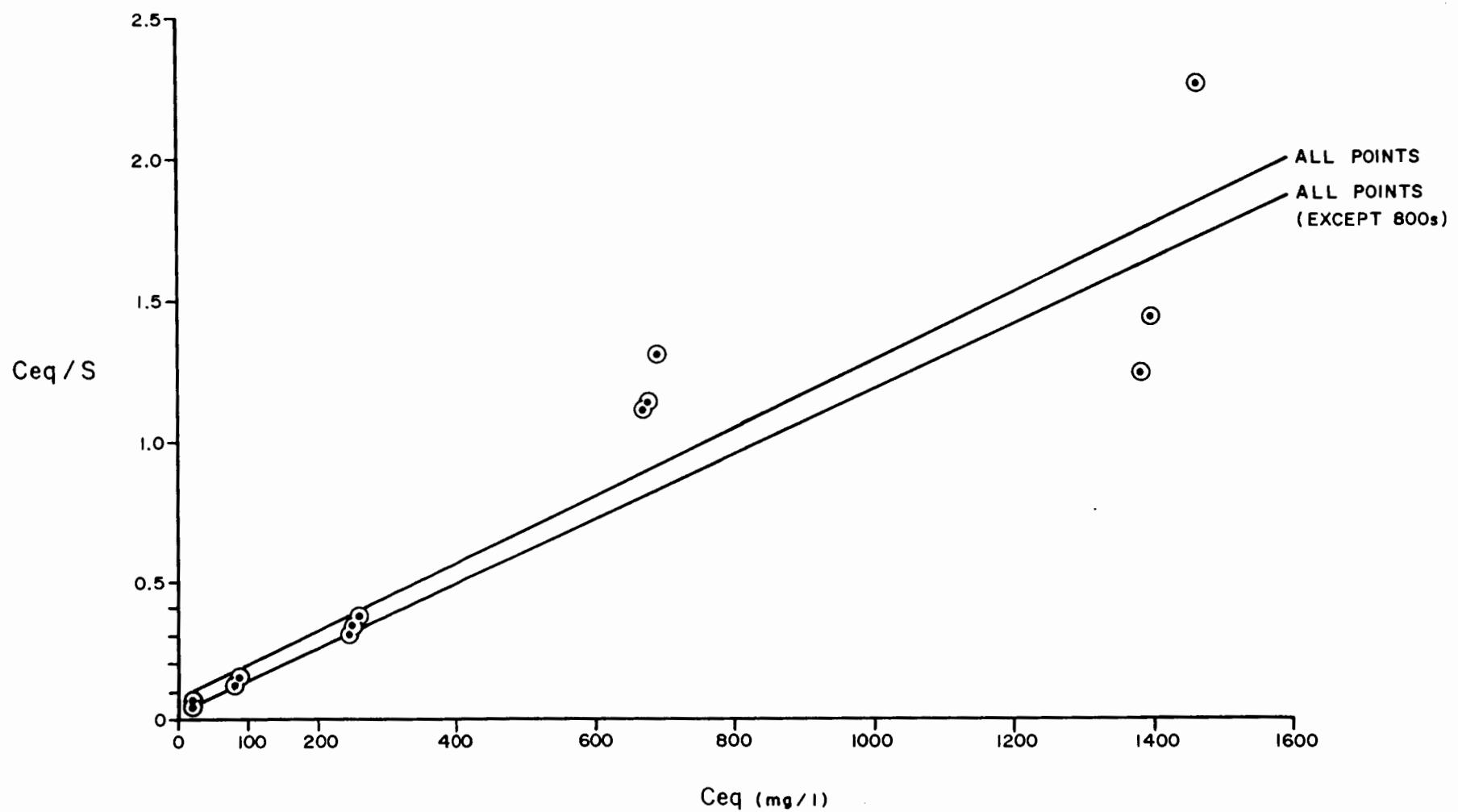


Figure 31. Langmuir plot of sorption data

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using 40 ml of the 1 M.KCL solution. The remaining 90 percent of the sorbed chromium is likely to be irreversibly sorbed. A blank soil sample (i.e., never contacted with chromium solution) was also placed in contact with the 1 M.KCL solution and shaken for 24 hours. The results show no detectable levels of chromium in the extract.

The results of the study indicate that the maximum sorption capacity of the Aquia soil material is in the range of 830 to 900 ug/g of soil. Ninety percent of the sorbed chromium was not desorbed (which would be equivalent to 747 to 810 ug/g for the chromium-saturated soil). These levels are much higher than the rigorous acid digestion extraction levels of chromium found in the same soils (less than 75 ug/g). Assuming the acid digestion extraction would release all sorbed chromium, then only nine to ten percent of the irreversible sorption capacity for chromium of these soils has occurred.

The irreversible nature of chromium sorption in these soils is consistent with a literature review conducted by the Electric Power Research Institute (EPRI 1984). EPRI indicates that chromium is strongly and specifically sorbed by soil iron oxides and manganese oxides. These compounds are particularly common in the Aquia Formation where iron cementation (ironstone) frequently occurs. It is likely that this is the mechanism for irreversible chromium sorption in the Aquia Formation samples tested in this study.

These observations strongly suggest that chromium migrating from Dry Well DW-9 into the surrounding soils has been, for the most part, irreversibly sorbed and is highly unlikely to migrate further through the unsaturated zone.

## 6.0 CONCEPTUAL REMEDIAL MEASURES

An engineering subsidiary of Geraghty & Miller, Inc., G&M Consulting Engineers, Inc. (GMCE), prepared a screening of the most practical and applicable technologies for remediation of ground water, sludges, and soils at the project site. A copy of the GMCE report is found in Appendix E. The remedial actions technology screening focused on the two principal problems at the Honeywell Signal Analysis Center, 1) ground waters containing VOCs and 2) the contents of, and soils immediately below, Dry Well DW-9.

Ground-water remedial actions included a number of technology components for each of the following:

- No action
- Institutional actions
- Containment
- Collection
- Treatment
- Discharge.

The no-action and containment options were listed, but considered to be not applicable.

The screening process resulted in the set of ground-water remedial measures shown in Figure 32. Recovery or collection of ground water containing VOCs can be effectively accomplished with either a subsurface drain or closely spaced recovery wells. The most efficient location of the recovery

RECOVERY

SUBSURFACE  
DRAIN

RECOVERY  
WELLS

TREATMENT

ACTIVATED  
CARBON

AIR STRIPPING

UV / HP

DISCHARGE

POTW

SURFACE WATER

GROUND WATER

LEGEND:

— — — POTENTIALLY APPLICABLE IN THE NEAR FUTURE

Figure 32

**GMCE**

G & M CONSULTING ENGINEERS, INC.

**GROUND WATER  
REMEDIAL MEASURES**

HONEYWELL, INC.  
ANNAPOLIS, MARYLAND

DRAWING NO:	DATE:
TE0084-AA1-A01	
DRAWN BY:	DATE:
SKF.	6/3/88
CHECKED:	DATE:
GJR	5/16/88
APPROVED:	DATE:

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system would be along the south side of MD Rt. 450 where the shallow ground waters with VOCs naturally discharge. A subsurface drain appears to be the most practical technology. A drainage line would be placed below grade in the vicinity of the road-side ditch and connected to a sump/pumping station. Surface-water run-on could be controlled to prevent an overload of the pumps and treatment system. A modelling effort will be needed to fully design the recovery system, particularly if a ground-water discharge system is used to dispose of the treated waters.

Treatment of the VOC-containing ground water can be affected with a) activated carbon, b) air stripping (with or without activated carbon), or c) UV/Hydrogen peroxide oxidation. Discharge options for the treated effluent are limited to nearby surface waters (i.e., Broad Creek tributary), ground waters, or in the future, a publicly-owned treatment works (POTW). Ground-water discharge could be accomplished via dry wells or trenches. A discharge at an upgradient location could act to accelerate recovery of ground waters containing VOCs. The POTW option is possible only if a connection is made in the future and if a sufficient allocation of flow is provided.

Remedial technologies screened for Dry Well DW-9 sludges and related bottom soils included the following actions:

- No action
- Institutional Actions
- Containment
- Diversion
- Treatment
- Disposal.

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The no-action, containment, and diversion options were listed, but not considered applicable.

Results of the screening for sludge/soil remedial measures for Dry Well DW-9 are summarized in Figure 33. Applicable treatment technologies for the excavated sludge and bottom soils include drying, mechanical dewatering, solidification/stabilization and off-site incineration. Disposal options include an off-site RCRA landfill or an on-site facility.

REMOVAL

EXCAVATION

TREATMENT

DRYING

MECHANICAL  
DEWATERING

SOLIDIFICATION/  
STABILIZATION

OFF-SITE  
INCINERATION

DISPOSAL

RCRA LANDFILL

ON-SITE

Figure 33

DRAWING NO:	
TE0084-AA1-A02	
DRAWN BY:	DATE:
SK.F	5/3/88
CHECKED:	DATE:
GJR	5/14/88
APPROVED:	DATE:

**GMCE**  
G&M CONSULTING ENGINEERS, INC

**SLUDGE/ SOIL  
REMEDIAL MEASURES**  
HONEYWELL, INC.  
ANNAPOLIS, MARYLAND

#### 7.0 Follow-On Investigations

Follow-on investigations will be needed before the design and implementation of remedial measures. These investigations will not require a substantial length of time to conduct (i.e., two months). These investigations are intended to provide characterization of important hydraulic parameters and seasonal changes in ground-water flow patterns. Proposed follow-on activities are as follows:

- Testing of the Aquia and Brightseat Formations for transmissivity, hydraulic conductivity and storage coefficient.
- Surveying the road-side ditch south of MD Rt. 450.
- Identification of flow paths north of MD Rt. 450 leading to the tributary to Broad Creek.
- Continued development of GM-11.
- Another full round of sampling of the monitoring-well network and selected stream/ditch locations.

After these investigations are complete, a feasibility design study can be undertaken.

## APPENDIX A

### ANALYTICAL RESULTS

- A.1 Dry Well and Septic Tank/Pit Contents
- A.2 Drinking Water Wells
- A.3 Monitoring Wells 1st Round Streams and Mini-Piezometers
- A.4 Surface Waters Ditch
- A.5 Borings Adjacent to Dry Wells and Septic Tanks/Pit
- A.6 Background Soil Conditions
- A.7 Isopropanol Disposal Area
- A.8 Screened Interval Samples
- A.9 Graphs

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## **APPENDIX A.1**

### **Dry Well and Septic Tanks/Pit Contents**

**Table A.1.1.**  
Volatile Organic Data from Drywell Sludges

SAMPLE ID DATE SAMPLED REPLICATE OF:	DWS-5-1 10-7-87	DWS-7-1 10-8-87	DWS-8-1 10-8-87	DWS-9-1 10-8-87	DWS-9-2 10-8-87	DWS-9-3 11-04-87	DWS-9-4 11-04-87	DWS-10-1 10-8-87
<hr/>								
<b>PARAMETER</b>								
Chloromethane	<10	<10	<10	<62,000	<6400	<2000	<2000	<40
Bromomethane	<10	<10	<10	<62,000	<6400	<2000	<2000	<40
Vinyl Chloride	<10	<10	<10	<62,000	<6400	<2000	<2000	<40
Chlorethane	<10	<10	<10	<62,000	<6400	<2000	<2000	<40
Methylene Chloride	20	16	34	45,500	9,300	3,200	4,200	110
Acetone	175	125	150	<62,000	8,000	---	---	170
Carbon Disulfide	16	<5	8	<31,000	<3200	---	---	20
1,1-Dichloroethene	<5	4*	<5	<31,000	124,000	55,000	28,000	<20
1,1-Dichloroethane	<5	12	<5	<31,000	8,900	5,000	2,000	<20
1,2-Dichloroethene (total)	<5	4*	<5	<31,000	<3200	---	---	<20
Chloroform	<5	<5	<5	<31,000	<3200	<1000	<1000	<20
1,2-Dichloroethane	<5	<5	<5	<31,000	<3200	4,000,000	2,000,000	<20
trans 1,2-Dichloroethene	---	---	---	---	---	<1000	<1000	---
2-Butanone	<10	38	50	<62,000	<6400	---	---	64
1,1,1-Trichloroethane	5	10	28	1,974,000	2,710,000	<1000	<1000	<20
Carbon Tetrachloride	<5	<5	<5	212,500	308,000	<1000	<1000	<20
Vinyl Acetate	<10	<10	<10	<62,000	<6400	---	---	<20
Bromodichloromethane	<5	<5	<5	<31,000	<3200	<1000	<1000	<20
1,2-Dichloropropane	<5	<5	<5	<31,000	<3200	<1000	<1000	<20
cis 1,3-Dichloropropene	<5	<5	<5	<31,000	<3200	<1000	<1000	<20
Trichloroethene	16	30	60	19,670,000	4,040,000	8,000,000	5,000,000	180
Dibromochloromethane	<5	<5	<5	<31,000	<3200	<1000	<1000	<20
1,1,2-Dichloropropene	<5	<5	<5	<31,000	<3200	---	---	<20
Benzene	<5	2*	<5	<31,000	<3200	---	---	<20
trans 1,3-Dichloropropene	<5	<5	<5	<31,000	<3200	<1000	<1000	<20
Bromoform	<5	<5	<5	<31,000	<3200	<1000	<1000	<20
4-Methyl-2-Pentanone	<10	<10	<10	<62,000	<6400	---	---	<40
2-Hexanone	<10	<10	<10	<62,000	<6400	---	---	<40
Tetrachloroethene	<5	<5	<5	<31,000	3,050,000	2,000,000	2,500,000	30
Toluene	20	20	30	<31,000	340,000	5,200	<1000	<20
1,1,2,2-Tetrachloroethane	<5	<5	<5	<31,000	<3200	<1000	<1000	<20
Chlorobenzene	<5	<5	<5	<31,000	<3200	<1000	<1000	<20
Ethylbenzene	8	30	52	<31,000	3,900	<1000	6,200	<20
Styrene	<5	<5	<5	<31,000	<3200	---	---	<20
Xylenes (total)	12	65	88	<31,000	8,000	5,000	41,000	45
1,1,2-Trichloroethane	---	---	---	---	---	<1000	<1000	---
2-Chloroethylvinylether	---	---	---	---	---	<2000	<2000	---

All concentrations are in ug/Kg. \* Compound identified below quantitation level. --- Parameter not analyzed.

TABLE A.1.1. (cont.)  
Volatile Organic Data from Drywell Sludges

SAMPLE ID	DWS-11-1 10-7-87	DWS-12-1 10-8-87	DWS-13-1 10-8-87	DWS-16-1 10-8-87
REPLICATE OF:				
PARAMETER				
Chloromethane	<10	<10	<10	<10
Bromomethane	<10	<10	<10	<10
Vinyl Chloride	<10	<10	<10	<10
Chlorethane	<10	<10	<10	<10
Methylene Chloride	22	22	25	5
Acetone	22	30	20	125
Carbon Disulfide	5	5	5	5
1,1-Dichloroethene	5	5	5	5
1,1-Dichloroethane	5	5	14	5
1,2-Dichloroethene (total)	5	8	5	5
Chloroform	5	5	5	5
1,2-Dichloroethane	5	5	5	5
trans 1,2-Dichloroethene	..	..	..	..
2-Butanone	<10	<10	<10	<10
1,1,1-Trichloroethane	8	8	60	5
Carbon Tetrachloride	5	5	5	5
Vinyl Acetate	<10	<10	<10	<10
Bromodichloromethane	5	5	5	5
1,2-Dichloropropane	5	5	5	5
cis 1,3-Dichloropropene	5	5	5	5
Trichloroethene	6	25	84	5
Dibromochloromethane	5	5	5	5
1,1,2-Dichloropropene	5	5	5	5
Benzene	5	5	5	5
trans 1,3-Dichloropropene	5	5	5	5
Bromoform	5	5	5	5
4-Methyl-2-Pentanone	<10	<10	<10	<10
2-Hexanone	<10	<10	<10	<10
Tetrachloroethene	5	140	50	5
Toluene	5	3*	55	86
1,1,2,2-Tetrachloroethane	5	5	5	5
Chlorobenzene	5	5	5	5
Ethylbenzene	5	5	62	5
Styrene	5	5	5	5
Xylenes (total)	5	5	155	5
1,1,2-Trichloroethane	..	..	..	..
2-Chloroethylvinylether	...	...	...	...

All concentrations are in ug/Kg. \* Compound not identified below quantitation level. --- Parameter not analyzed.

**TABLE A.1.2.**  
Inorganic Data from Drywell Sludges

SAMPLE ID	SAMPLED	Ag	As	Ba	Cd	Cn	Cr	Cr 6	Cu	Hg	Ni	Pb	Se	Zn	pH	% TS
DWS-5-1	10-07-87	3	10	190	6	<10	102	<1	720	0.1	13	61	<0.5	890	---	40.0
DWS-7-1	10-08-87	<1	20	170	7	<10	99	<1	104	0.2	10	95	<0.5	6400	---	52.2
DWS-8-1	10-08-87	1140	10	220	92	<10	177	<1	3870	0.2	14	74	<0.5	1420	---	13.6
DWS-9-1	10-08-87	12	100	1560	73	<50	1890	<1	2040	0.1	370	870	<0.5	3430	---	21.4
DWS-9-2	10-08-87	3	200	6000	31	<50	10300	<1	2860	<0.1	65	820	<0.5	41600	---	18.4
DWS-9-3	11-04-87	3	20	7700	64	280	9100	1.3	1400	0.8	80	730	<1	2	7.7	23.2
DWS-9-4	11-04-87	2	30	7100	24	49	5800	1.1	690	1	36	530	<1	2	8.0	32.3
DWS-10-1	10-08-87	5	10	100	<1	<10	58	<1	53	0.1	14	16	<0.5	268	---	51.9
DWS-11-1	10-07-87	<1	10	<100	<1	<10	85	<1	35	0.1	5	7	<0.5	284	---	67.6
DWS-12-1	10-08-87	62	10	<100	3	<10	77	<1	13	<0.1	<1	10	<0.5	83	---	63.9
DWS-13-1	10-08-87	<1	<10	<100	<1	<10	88	<1	35	0.2	4	18	<0.5	337	---	68.4
DWS-16-1	10-07-87	<1	<10	<100	<1	<10	56	<1	26	0.1	13	11	<0.5	159	---	42.9

Metal concentrations are in mg/Kg. --- Parameter not analyzed.

TABLE A.1.3.  
Inorganic Data from Extraction Procedure Toxicity Method

SAMPLE ID	SAMPLED	Ag	As	Ba	Cd	Cr	Cu	Hg	Ni	Pb	Se	Zn
DWB-04-50	10-15-87	<0.01	<0.05	<0.5	<0.01	<0.01	<0.01	<0.001	<0.01	<0.01	<0.01	0.01
DWB-05-40	10-16-87	<0.01	<0.05	<0.5	<0.01	<0.01	<0.01	<0.001	<0.01	<0.01	<0.01	0.23
DWB-07-45	10-29-87	<0.01	<0.05	<0.5	<0.01	<0.01	0.01	<0.001	<0.01	<0.01	<0.01	0.07
DWB-08-38	10-23-87	<0.01	<0.05	<0.5	<0.01	<0.01	<0.01	<0.001	<0.01	<0.01	<0.01	0.08
DWB-9D-34	11-03-87	<0.01	<0.05	<0.5	<0.01	0.05	0.02	<0.001	<0.01	<0.01	<0.01	0.18
DWB-9D-69	11-03-87	<0.01	<0.05	<0.5	<0.01	0.02	<0.01	<0.001	<0.01	<0.01	<0.01	0.01
DWB-9U-50	10-30-87	<0.01	<0.05	<0.5	<0.01	0.46	<0.01	<0.001	<0.01	<0.01	<0.01	0.04
DWB-9U-95	11-02-87	<0.01	<0.05	<0.5	<0.01	0.01	<0.01	<0.001	<0.01	<0.01	<0.01	0.07
DWB-10-39	10-19-87	<0.01	<0.05	<0.5	<0.01	<0.01	<0.01	<0.001	<0.01	<0.01	<0.01	0.05
DWB-11-45	10-22-87	<0.01	<0.05	<0.5	<0.01	<0.01	<0.01	<0.001	<0.01	<0.01	<0.01	0.23
DWB-12-35	10-27-87	<0.01	<0.05	<0.5	<0.01	<0.01	<0.01	<0.001	<0.01	<0.01	<0.01	0.02
DWB-13-49	10-29-87	<0.01	<0.05	<0.5	<0.01	<0.01	<0.01	<0.001	<0.01	<0.01	<0.01	0.10
DWB-15-60	10-28-87	<0.01	<0.05	<0.5	<0.01	<0.01	<0.01	<0.001	<0.01	<0.01	<0.01	0.01
DWB-16-65	10-22-87	<0.01	<0.05	<0.5	<0.01	<0.01	<0.01	<0.001	<0.01	<0.01	<0.01	0.01
STB-11-20	10-19-87	<0.01	<0.05	<0.5	<0.01	<0.01	<0.01	<0.001	<0.01	<0.01	<0.01	0.01
STB-10-14	10-19-87	<0.01	<0.05	<0.5	<0.01	<0.01	<0.01	<0.001	<0.01	<0.01	<0.01	0.02
STB-3I-19	10-14-87	<0.01	<0.05	<0.5	<0.01	<0.01	<0.01	<0.001	<0.01	<0.01	<0.01	0.10
STB-30-13	10-15-87	<0.01	<0.05	<0.5	<0.01	<0.01	<0.01	<0.001	<0.01	<0.01	<0.01	0.05
STB-6I-10	10-26-87	<0.01	<0.05	<0.5	<0.01	<0.01	<0.01	<0.001	<0.01	<0.01	<0.01	0.01
STB-60-14	10-26-87	<0.01	<0.05	<0.5	<0.01	<0.01	<0.01	<0.001	<0.01	<0.01	<0.01	0.01
STB-14I-20	10-14-87	<0.01	<0.05	<0.5	<0.01	<0.01	<0.01	<0.001	<0.01	<0.01	<0.01	0.05
DWS-5-1	10-07-87	<0.01	<0.01	0.8	<0.01	0.02	0.03	<0.001	0.18	<0.02	<0.005	5.8
DWS-7-1	10-08-87	<0.01	<0.01	<0.5	<0.01	<0.02	<0.01	<0.001	0.10	<0.02	<0.005	3.82
DWS-8-1	10-08-87	<0.01	<0.01	<0.5	0.09	<0.02	<0.01	<0.001	0.12	<0.02	<0.005	2.88
DWS-9-1	10-08-87	<0.01	<0.01	18.4	0.19	<0.02	0.52	<0.001	0.35	0.09	<0.005	3.85
DWS-9-2	10-08-87	<0.01	<0.01	2.3	0.06	0.88	0.51	<0.001	0.18	0.16	<0.005	71
DWS-9-3	04-11-88	<0.01	<0.01	1.3	0.17	0.16	0.34	<0.001	<0.02	<0.02	<0.01	50.0
DWS-9-4	04-11-88	<0.01	<0.01	0.8	0.06	0.24	0.15	<0.001	<0.02	<0.02	<0.01	51.5
DWS-10-1	10-08-87	<0.01	<0.01	0.8	<0.01	<0.02	<0.01	<0.001	<0.02	<0.02	<0.005	1.71
DWS-11-1	10-07-87	<0.01	<0.01	<0.5	<0.01	<0.02	0.08	<0.001	0.09	<0.02	<0.005	2.36
DWS-12-1	10-08-87	<0.01	<0.01	0.7	<0.01	<0.02	<0.01	<0.001	<0.02	<0.02	<0.005	0.61
DWS-13-1	10-08-87	<0.01	<0.01	0.8	<0.01	<0.02	<0.01	<0.001	0.11	<0.02	<0.005	1.71
DWS-16-1	10-07-87	<0.01	0.01	0.8	<0.01	<0.02	<0.01	<0.001	<0.02	<0.02	<0.005	0.96
IPB1-6	10-13-87	<0.01	<0.01	<0.5	<0.01	<0.02	0.02	<0.001	<0.02	<0.02	<0.005	0.07
IPB1-24	10-13-87	<0.01	<0.01	<0.5	<0.01	<0.02	<0.01	<0.001	<0.02	<0.02	<0.005	<0.02
IPB1-48	10-13-87	<0.01	<0.01	<0.5	<0.01	<0.02	<0.01	<0.001	<0.02	<0.02	<0.005	0.06
IPB2-6	10-13-87	<0.01	<0.01	<0.5	<0.01	<0.02	<0.01	<0.001	<0.02	<0.02	<0.005	0.04
IPB2-24	10-13-87	<0.01	<0.01	<0.5	<0.01	<0.02	<0.01	<0.001	<0.02	<0.02	<0.005	<0.02
IPB2-48	10-13-87	<0.01	<0.01	<0.5	<0.01	<0.02	0.02	<0.001	<0.02	<0.02	<0.005	0.09
DWB-9D-29	11-03-87	---	---	---	---	0.14	---	---	---	---	---	---
DWB-9D-39	11-03-87	---	---	---	---	0.56	---	---	---	---	---	---
DWB-9D-44	11-03-87	---	---	---	---	0.93	---	---	---	---	---	---
DWB-9D-49	11-03-87	---	---	---	---	1.05	---	---	---	---	---	---
DWB-9D-54	11-03-87	---	---	---	---	0.61	---	---	---	---	---	---
DWB-9D-59	11-03-87	---	---	---	---	0.30	---	---	---	---	---	---
DWB-9D-64	11-03-87	---	---	---	---	0.42	---	---	---	---	---	---
DWB-9D-74	11-03-87	---	---	---	---	0.30	---	---	---	---	---	---

**TALBE A.1.4.**  
Volatile Organic Data from Drywell and Septic Tank Waters

SAMPLE ID	DW-4 10-5-87	DW-8 10-5-87	DW-28 10-5-87	DW-10 10-5-87	DW-11 10-5-87	DW-13 10-5-87	DW-15 10-5-87	DW-16 10-5-87	ST-1 10-5-87	ST-3 10-5-87	ST-6 10-5-87	ST-14 10-5-87
REPLICATE OF:	DW-8											
<hr/>												
PARAMETER												
Benzene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Carbon Tetrachloride	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Chlorobenzene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
1,2-Dichloroethane	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	56	<2
1,1,1-Trichloroethane	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
1,1-Dichloroethane	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
1,1,2-Trichloroethane	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
1,1,2,2-Tetrachloroethane	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Chloroethane	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
2-Chloroethylvinylether	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Chloroform	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
1,1-Dichloroethene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
trans 1,2-Dichloroethene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Ethylbenzene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
1,3-Dichloropropene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
1,2-Dichloropropane	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Methylene Chloride	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Methyl Chloride	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Methyl Bromide	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Bromoform	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Dichlorobromomethane	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Chlorodibromomethane	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Tetrachloroethene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Trichloroethene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Toluene	45	33	45	45	45	45	45	45	30	45	78	45
Vinyl Chloride	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Xylenes (o-,m-,p-)	5	5	5	5	5	5	5	5	20	5	5	5

All concentrations are in ug/L.

**TABLE A.1.5.**  
Inorganic Data from Drywell and Septic Tank Liquids

SAMPLE ID	REP. OF	SAMPLED	Ag	As	Ba	Cd	Cn	Cr	Cr 6	Cu	Hg	Ni	Pb	Se	Zn
DW-4	DW-8	10-05-87	<0.01	<0.01	<0.5	<0.01	0.02	<0.01	<0.01	0.20	<0.001	<0.01	<0.01	<0.005	0.08
DW-8		10-05-87	<0.01	<0.01	<0.5	<0.01	0.02	<0.01	<0.01	<0.01	<0.001	<0.01	<0.01	<0.005	0.05
DW-28		10-05-87	0.02	<0.01	<0.5	<0.01	0.02	<0.01	<0.01	<0.01	<0.001	<0.01	<0.01	<0.005	0.06
DW-10		10-05-87	<0.01	<0.01	<0.5	<0.01	<0.01	<0.01	<0.01	<0.01	<0.001	<0.01	<0.01	<0.005	0.02
DW-11		10-05-87	<0.01	<0.01	<0.5	<0.01	0.03	<0.01	<0.01	0.04	<0.001	0.12	<0.01	<0.005	1.08
DW-13		10-05-87	<0.01	<0.01	1.5	<0.01	<0.01	0.76	<0.01	0.23	0.002	0.28	0.20	<0.005	1.85
DW-15		10-05-87	<0.01	<0.01	<0.5	<0.01	<0.01	<0.01	<0.01	0.03	0.004	<0.01	<0.01	<0.005	0.06
DW-16		10-05-87	<0.01	<0.01	<0.5	<0.01	0.02	<0.01	<0.01	0.20	<0.001	<0.01	<0.01	<0.005	0.18
ST-1		10-05-87	0.04	<0.01	<0.5	<0.01	0.02	<0.01	<0.01	<0.01	<0.001	<0.01	<0.01	<0.005	0.11
ST-3		10-05-87	<0.01	<0.01	<0.5	<0.01	0.02	0.05	<0.01	0.08	<0.001	0.05	<0.01	<0.005	0.10
ST-6		10-05-87	<0.01	<0.01	<0.5	<0.01	0.01	0.10	<0.01	0.03	0.001	0.06	<0.01	<0.005	0.11
ST-14		10-05-87	<0.01	<0.01	<0.5	<0.01	0.04	<0.01	<0.01	0.23	0.001	0.05	<0.01	<0.005	1.65

Metal concentrations are in mg/L.

GERAGHTY & MILLER, INC.

## **APPENDIX A.2**

### **Drinking Water Wells**

**TABLE A.2.1.**  
Public Drinking Water Supplies

SAMPLE ID DATE SAMPLED REPLICATE OF:	W-2 4-6-87	W-2 1-4-88	W-2 2-23-88	W-2 3-28-88	W-2 4-18-88	W-5 4-6-87	W-5 1-4-88	W-5 2-23-88	W-5 3-28-88	W-5 4-18-88	W-6 4-6-87
<b>PARAMETER</b>											
Carbon Tetrachloride	<1	<1.0	<1	<1	<1	<1	<1.0	<1	<1	<1	<1
Chlorobenzene	<1	<1.0	<1	<1	<1	<1	<1.0	<1	<1	<1	<1
1,2-Dichloroethane	<1	<1.0	<1	<1	<1	<1	<1.0	<1	<1	<1	<1
1,1,1-Trichloroethane	<1	<1.0	<1	<1	<1	<1	<1.0	<1	<1	<1	<1
1,1-Dichloroethane	<1	<1.0	<1	<1	<1	<1	<1.0	<1	<1	<1	<1
1,1,2-Trichloroethane	<1	<1.0	<1	<1	<1	<1	<1.0	<1	<1	<1	<1
1,1,2,2-Tetrachloroethane	<1	<1.0	<1	<1	<1	<1	<1.0	<1	<1	<1	<1
Chloroethane	<10	<1.0	<1	<1	<1	<10	<1.0	<1	<1	<1	<10
2-Chloroethylvinylether	<10	<1.0	<1	<1	<1	<10	<1.0	<1	<1	<1	<10
chloroform	<1	<1.0	<1	<1	<1	<1	<1.0	<1	<1	<1	<1
1,1-Dichloroethene	<1	<1.0	<1	<1	<1	<1	<1.0	<1	<1	<1	<1
trans 1,2-Dichloroethene	<1	<1.0	<1	<1	<1	<1	<1.0	<1	<1	<1	<1
1,2-Dichloropropane	<1	<1.0	<1	<1	<1	<1	<1.0	<1	<1	<1	<1
1,3-Dichloropropene	<1	<1.0	<1	<1	<1	<1	<1.0	<1	<1	<1	<1
Methylene Chloride	<1	<1.0	<1	<1	<1	<1	<1.0	<1	<1	<1	<1
Methyl Chloride	<10	<1.0	<1	<1	<1	<10	<1.0	<1	<1	<1	<10
Methyl Bromide	<10	<1.0	<1	<1	<1	<10	<1.0	<1	<1	<1	<10
Bromoform	<1	<1.0	<1	<1	<1	<1	<1.0	<1	<1	<1	<1
Dichlorobromomethane	<1	<1.0	<1	<1	<1	<1	<1.0	<1	<1	<1	<1
Chlorodibromomethane	<1	<1.0	<1	<1	<1	<1	<1.0	<1	<1	<1	<1
Tetrachloroethene	<1	<1.0	<1	<1	<1	<1	<1.0	<1	<1	<1	<1
Trichloroethene	<1	<1.0	<1	<1	<1	<1	<1.0	<1	<1	<1	<1
Vinyl Chloride	<10	<1.0	<1	<1	<1	<10	<1.0	<1	<1	<1	<10
Trichlorofluoromethane	---	<1.0	<1	<1	<1	---	<1.0	<1	<1	<1	---
cis 1,3-Dichloropropene	---	<1.0	<1	<1	<1	---	<1.0	<1	<1	<1	---
trans 1,3-Dichloropropene	---	<1.0	<1	<1	<1	---	<1.0	<1	<1	<1	---
Dichlorodifluoromethane	---	<1.0	<1	<1	<1	---	<1.0	<1	<1	<1	---
Benzene	---	---	---	---	---	---	---	---	---	---	---
Toluene	---	---	---	---	---	---	---	---	---	---	---
Ethylbenzene	---	---	---	---	---	---	---	---	---	---	---
1,4-Dichlorobenzene	---	---	---	---	---	---	---	---	---	---	---
1,3-Dichlorobenzene	---	---	---	---	---	---	---	---	---	---	---
1,2-Dichlorobenzene	---	---	---	---	---	---	---	---	---	---	---

All concentrations are in ug/L. --- Parameter not analyzed.

TABLE A.2.1. (cont.)  
Public Drinking Water Supplies

SAMPLE ID DATE SAMPLED REPLICATE OF:	W-1 4-6-87 W-6	W-7 4-6-87	W-8 4-6-87	W-9 4-6-87	W-9 1-4-88	W-9 2-23-88	W-9 3-28-88	W-9 4-18-88	AAC-3 4-6-87	PONDED AREA 3-28-88 NEXT TO #2
<b>PARAMETER</b>										
Carbon Tetrachloride	<1	<1	<1	<1	<1.0	<1	<1	<1	<1	<1
Chlorobenzene	<1	<1	<1	<1	<1.0	<1	<1	<1	<1	<1
1,2-Dichloroethane	<1	<1	<1	<1	<1.0	<1	<1	<1	<1	<1
1,1,1-Trichloroethane	<1	<1	<1	<1	<1.0	<1	<1	<1	<1	<1
1,1-Dichloroethane	<1	<1	<1	<1	<1.0	<1	<1	<1	<1	<1
1,1,2-Trichloroethane	<1	<1	<1	<1	<1.0	<1	<1	<1	<1	<1
1,1,2,2-Tetrachloroethane	<1	<1	<1	<1	<1.0	<1	<1	<1	<1	<1
Chloroethane	<10	<10	<10	<10	<1.0	<1	<1	<1	<1	<1
2-Chloroethylvinylether	<10	<10	<10	<10	<1.0	<1	<1	<1	<1	<1
Chloroform	<1	<1	<1	<1	<1.0	<1	<1	<1	<1	<1
1,1-Dichloroethene	<1	<1	<1	<1	<1.0	<1	<1	<1	<1	<1
trans 1,2-Dichloroethene	<1	<1	<1	<1	<1.0	<1	<1	<1	<1	<1
1,2-Dichloropropane	<1	<1	<1	<1	<1.0	<1	<1	<1	<1	<1
1,3-Dichloropropene	<1	<1	<1	<1	<1.0	<1	<1	<1	<1	<1
Methylene Chloride	<1	<1	<1	<1	<1.0	<1	<1	<1	<1	<1
Methyl Chloride	<10	<10	<10	<10	<1.0	<1	<1	<1	<1	<1
Methyl Bromide	<10	<10	<10	<10	<1.0	<1	<1	<1	<1	<1
Bromoform	<1	<1	<1	<1	<1.0	<1	<1	<1	<1	<1
Dichlorobromomethane	<1	<1	<1	<1	<1.0	<1	<1	<1	<1	<1
Chlorodibromomethane	<1	<1	<1	<1	<1.0	<1	<1	<1	<1	<1
Tetrachloroethene	<1	<1	<1	<1	<1.0	<1	<1	<1	<1	<1
Trichloroethene	<1	<1	<1	<1	<1.0	<1	<1	<1	<1	<1
Vinyl Chloride	<10	<10	<10	<10	<1.0	<1	<1	<1	<1	<1
Trichlorofluoromethane	:	:	:	:	:	:	<1.0	<1.0	<1.0	<1.0
cis 1,3-Dichloropropene	:	:	:	:	:	:	<1.0	<1.0	<1.0	<1.0
trans 1,3-Dichloropropene	:	:	:	:	:	:	<1.0	<1.0	<1.0	<1.0
Dichlorodifluoromethane	:	:	:	:	:	:	<1.0	<1.0	<1.0	<1.0
Benzene	:	:	:	:	:	:	<1.0	<1.0	<1.0	<1.0
Toluene	:	:	:	:	:	:	<1.0	<1.0	<1.0	<1.0
Ethylbenzene	:	:	:	:	:	:	<1.0	<1.0	<1.0	<1.0
1,4-Dichlorobenzene	:	:	:	:	:	:	<1.0	<1.0	<1.0	<1.0
1,3-Dichlorobenzene	:	:	:	:	:	:	<1.0	<1.0	<1.0	<1.0
1,2-Dichlorobenzene	:	:	:	:	:	:	<1.0	<1.0	<1.0	<1.0

All concentrations are in ug/L. --- Parameter not analyzed.

TABLE A.2.2.  
Inorganic Data from Public Drinking Water Supplies

SAMPLE ID	REP. OF	SAMPLED	As	Ba	Cd	Cr	Cr 6	Pb	Hg	Se	NO3	F	pH	DS
W-2		04-06-87	<0.01	<0.5	<0.01	<0.01	<0.01	<0.01	<0.001	<0.02	<0.1	0.2	5.9	63
W-5		04-06-87	<0.01	<0.5	<0.01	<0.01	<0.01	<0.01	<0.001	<0.02	<0.1	0.2	6.0	64
W-6		04-06-87	<0.01	<0.5	<0.01	<0.01	<0.01	<0.01	<0.001	<0.02	<0.1	0.2	5.7	54
W-1	W-6	04-06-87	<0.01	<0.5	<0.01	<0.01	<0.01	<0.01	<0.001	<0.02	<0.1	0.2	6.2	50
W-7		04-06-87	<0.01	<0.5	<0.01	<0.01	<0.01	<0.01	<0.001	<0.02	<0.1	0.3	5.9	81
W-8		04-06-87	<0.01	<0.5	<0.01	<0.01	<0.01	<0.01	<0.001	<0.02	<0.1	<0.2	5.9	43
W-9		04-06-87	<0.01	<0.5	<0.01	<0.01	<0.01	<0.01	<0.001	<0.02	<0.1	<0.2	6.1	40
AAC-3		04-06-87	<0.01	<0.5	<0.01	<0.01	<0.01	<0.01	<0.001	<0.02	<0.1	<0.2	5.5	<2

All concentrations are in mg/L except pH.

GERAGHTY & MILLER, INC.

## **APPENDIX A.3**

### **Monitoring Wells 1'st Round Stream and Mini-Piezometers**

**TABLE A.3.1.**  
Volatile Organic Data from Post Development Sampling

SAMPLE ID	GM-6 2-11-88	GM-7 2-11-88	GM-101 2-11-88 GM-7	GM-8 3-22-88	GM-28 3-22-88 GM-8	GM-9 3-22-88	GM-10 3-22-88	GM-11 3-22-88	GM-12 12-10-87	GM-13 12-10-87
<b>PARAMETER</b>										
<b>Benzene</b>										
Carbon Tetrachloride	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Chlorobenzene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,2-Dichloroethane	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1,1-Trichloroethane	<1	<1	<1	230	220	<1	<1	<1	<1	<1
1,1-Dichloroethane	<1	<1	<1	6	6	<1	<1	<1	<1	<1
1,1,2-Trichloroethane	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1,2,2-Tetrachloroethane	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Chloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
2-Chloroethyl Vinyl Ether	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chloroform	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1-Dichloroethene	<1	<1	<1	150	150	<1	<1	<1	<1	<1
trans 1,2-Dichloroethene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Ethylbenzene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,3-Dichloropropene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,2-Dichloropropane	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Methylene Chloride	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Methyl Chloride	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Methyl Bromide	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromoform	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Dichlorobromomethane	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Chlorodibromomethane	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Tetrachloroethene	<1	<1	<1	8	8	<1	<1	<1	<1	<1
Trichloroethene	<1	<1	<1	990	960	<2	<6	32	<1	<1
Toluene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Vinyl Chloride	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10

All concentrations are in ug/L. --- Parameter not analyzed. \* Appear as GM-16 and GM-17 on certificate of analysis. \*\* Appear as HSP-2, HSP-1 and HSP-3 re-

**TABLE A.3.1. (cont.)**  
Volatile Organic Data from Post Development Sampling

SAMPLE ID	GM-14 12-10-87	GM-99 12-10-87	GM-15 12-10-87	GM-18 2-11-88	GMP-16* 12-10-87	GMP-17* 12-10-87	GMP-19** 1-7-88	GMP-20** 1-7-88	GMP-21** 1-8-88
<hr/>									
<hr/>									
PARAMETER									
Benzene	---	---	---	---	---	---	<1	<1	<1
Carbon Tetrachloride	<1	<1	<1	<1	<1	<1	<10	<10	<1
Chlorobenzene	<1	<1	<1	<1	<1	<1	<10	<10	<1
1,2-Dichloroethane	<1	<1	<1	<1	<1	<1	<10	<10	<1
1,1,1-Trichloroethane	<1	<1	<1	<1	3	120	7800	54	<1
1,1-Dichloroethane	<1	<1	<1	<1	6	3	51	<1	<1
1,1,2-Trichloroethane	<1	<1	<1	<1	<1	<1	<10	<10	<1
1,1,2,2-Tetrachloroethane	<1	<1	<1	<1	<1	<1	<10	<10	<1
Chloroethane	<10	<10	<10	<10	<10	<10	<10	<100	<10
2-Chloroethyl Vinyl Ether	<10	<10	<10	<10	<10	<10	<10	<100	<10
Chloroform	<1	<1	<1	<1	<1	<1	<1	<10	<1
1,1-Dichloroethene	<1	<1	<1	<1	<1	<1	70	3100	38
trans 1,2-Dichloroethene	<1	<1	<1	<1	<1	<1	<10	<10	<1
Ethylbenzene	---	---	---	---	---	---	<1	<1	<1
1,3-Dichloropropene	<1	<1	<1	<1	<1	<1	<1	<10	<1
1,2-Dichloropropane	<1	<1	<1	<1	<1	<1	<1	<10	<1
Methylene Chloride	2	<1	2	<1	3	1	<1	<10	<1
Methyl Chloride	<10	<10	<10	<10	<10	<10	<10	<100	<10
Methyl Bromide	<10	<10	<10	<10	<10	<10	<10	<100	<10
Bromoform	<1	<1	<1	<1	<1	<1	<1	<10	<1
Dichlorobromomethane	<1	<1	<1	<1	<1	<1	<1	<10	<1
Chlorodibromomethane	<1	<1	<1	<1	<1	<1	<1	<10	<1
Tetrachloroethene	<1	<1	<1	<1	<1	<1	34	1700	<1
Trichloroethene	<1	<1	<1	<1	<1	<1	140	22000	<1
Toluene	---	---	---	---	---	---	<1	9	<1
Vinyl Chloride	<10	<10	<10	<10	<10	<10	<10	<100	<10

All concentrations are in ug/L. --- Parameter not analyzed. \* Appear as GM-16 and GM-17 on certificate of analysis. \*\* Appear as HSP-2, HSP-1 and HSP-3 re-

TABLE A.3.2.  
Inorganic Data from Post Development Sampling

WELL ID	REP. OF	SAMPLED	Ag	As	Ba	Cd	Cr	Cr 6	Cu	Hg	Ni	Pb	Se	Zn	pH	SC	DS	SS
GM-6		02-11-88	<0.01	<0.01	<0.5	<0.01	0.03	<0.01	<0.01	<0.001	<0.02	<0.02	<0.005	0.12	5.2	63	67	44
GM-7		02-11-88	<0.01	0.02	<0.5	<0.01	0.24	<0.01	<0.01	<0.001	<0.02	<0.02	<0.005	0.14	5.6	33.8	93	704
GM-101	GM-7	02-11-88	<0.01	0.03	<0.5	<0.01	0.24	<0.01	<0.01	<0.001	0.06	<0.02	<0.005	0.14	5.6	33.8	92	852
GM-8		03-22-88	<0.01	<0.01	<0.5	<0.01	<0.01	<0.01	<0.01	<0.001	<0.02	<0.02	<0.005	0.02	5.2	130	100	23
GM-28	GM-8	03-22-88	<0.01	<0.01	<0.5	<0.01	<0.02	<0.01	<0.01	<0.001	<0.02	<0.02	<0.005	0.03	5.2	140	96	26
GM-9		03-22-88	<0.01	<0.01	<0.5	<0.01	<0.02	<0.01	<0.01	<0.001	<0.02	<0.02	<0.005	0.05	6.3	92	75	22
GM-10		03-22-88	<0.01	<0.01	<0.5	<0.01	<0.02	<0.01	<0.01	<0.001	<0.02	<0.02	<0.005	0.02	5.9	74	75	47
GM-11		03-22-88	<0.01	<0.01	<0.5	<0.01	0.06	<0.01	<0.01	<0.001	<0.02	<0.02	<0.005	1.00	6.9	270	186	219
GM-12		12-10-87	<0.01	<0.01	<0.5	<0.01	<0.01	<0.01	<0.01	<0.001	<0.02	<0.02	<0.005	<0.01	6.3	76	103	40
GM-13		12-10-87	<0.01	<0.01	<0.5	<0.01	<0.01	<0.01	<0.01	<0.001	<0.02	<0.02	<0.005	<0.01	6.5	46	60	21
GM-14	GM-14	12-10-87	<0.01	<0.01	<0.5	<0.01	<0.01	<0.01	<0.01	<0.0001	<0.02	<0.02	<0.005	<0.01	6.0	43	153	30
GM-99		12-10-87	<0.01	<0.01	<0.5	<0.01	<0.01	<0.01	<0.01	<0.001	<0.02	<0.02	<0.005	<0.01	6.1	46	62	30
GM-15		12-10-87	<0.01	<0.01	<0.5	<0.01	0.08	<0.01	<0.01	<0.0001	<0.02	<0.02	<0.005	0.02	5.7	44	85	84
GMP-16*		12-10-87	<0.01	<0.01	<0.5	<0.01	<0.01	<0.01	<0.01	<0.0001	<0.02	<0.02	<0.005	<0.01	5.0	38	61	297
GMP-17*		12-10-87	<0.01	0.01	<0.5	<0.01	0.09	<0.01	<0.01	<0.001	<0.02	<0.02	<0.005	0.04	5.0	39	46	831
GM-18		02-11-88	<0.01	<0.01	<0.5	<0.01	<0.02	<0.01	<0.01	<0.001	<0.02	<0.02	<0.005	0.02	6.1	97	65	116

Metals, SS and DS are in mg/L, SC units are umhos/c

--- Parameter not analyzed. \* Samples appear as GM-16 and GM-17 on the chain of cust. and cert. of anal.

**TABLE A.3.3.**  
Volatile Organic Data from First Round of Sampling

SAMPLE ID DATE SAMPLED REPLICATE OF:	GM-1 3-29-88	GM-2 3-29-88	GM-32 3-29-88 GM-2	GM-3 3-29-88	GM-4 3-30-88	GM-5 3-30-88	GM-6 3-29-88	GM-7 3-30-88	GM-8 3-29-88	GM-9 3-29-88	GM-10 3-29-88
<b>PARAMETER</b>											
Chloromethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromomethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Vinyl Chloride	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chlorehthane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Methylene Chloride	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1-Dichloroethene	31	540	500	48	24	46	>1	>1	>1	>1	>1
1,1-Dichloroethane	3	<1	7	17	<1	<1	<1	<1	<1	<1	<1
trans 1,2-Dichloroethene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Chloroform	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,2-Dichloroethane	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1,1-Trichloroethane	56	2000	2000	300	160	170	>1	>1	>1	>1	>1
Carbon Tetrachloride	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Bromodichloromethane	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,2-Dichloropropane	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
trans 1,3-Dichloropropene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Trichloroethylene	120	5900	5800	750	230	140	>1	>1	>1	>1	>1
Chlorodibromomethane	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1,2-Trichloroethane	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
cis 1,3-Dichloropropene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2-Chloroethylvinylether	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromoform	<10	13	13	<10	<10	<10	<10	<10	<10	<10	<10
1,1,2,2,-Tetrachloroethane	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Tetrachloroethylene	6	1800	1900	220	140	250	>1	>1	>1	>1	>1
Chlorobenzene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Benzene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Toluene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Ethylbenzene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Xylene (m-)	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Xylenes (o,p-)	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

All concentrations are in ug/L.

**TABLE A.3.3. (cont.)**  
**Volatile Organic Data from First Round of Sampling**

SAMPLE ID	GM-33 3-29-88	GM-11 3-30-88	GM-35 3-30-88	GM-12 3-28-88	GM-13 3-28-88	GM-14 3-28-88	GM-15 3-28-88	GMP-16 3-28-88	GMP-17 3-28-88	GM-18 3-28-88	GMP-19 3-28-88
DATE SAMPLED	3-29-88	3-30-88	3-30-88	3-28-88	3-28-88	3-28-88	3-28-88	3-28-88	3-28-88	3-28-88	3-28-88
REPLICATE OF:	GM-10		GM-11								
<b>PARAMETER</b>											
Chloromethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<100
Bromomethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<100
Vinyl Chloride	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<100
Chlorethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<100
Methylene Chloride	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10
1,1-Dichloroethene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	2400
1,1-Dichloroethane	<1	<1	3	<1	<1	<1	<1	<1	<1	<1	54
trans 1,2-Dichloroethene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10
Chloroform	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10
1,2-Dichloroethane	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10
1,1,1-Trichloroethane	<1	<1	3	<1	<1	<1	<1	<1	<1	<1	11000
Carbon Tetrachloride	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10
Bromodichloromethane	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10
1,2-Dichloropropane	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10
trans 1,3-Dichloropropene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10
Trichloroethene	3	28	29	<1	<1	<1	<1	<1	<1	<1	42000
Chlorodibromomethane	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10
1,1,2-Trichloroethane	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10
cis 1,3-Dichloropropene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10
2-Chloroethylvinylether	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<100
Bromoform	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	200
1,1,2,2-Tetrachloroethane	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10
Tetrachloroethene	<1	6	5	<1	<1	<1	<1	<1	<1	<1	2600
Chlorobenzene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10
Benzene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10
Toluene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10
Ethylbenzene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10
Xylene (m-)	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	7
Xylenes (o,p-)	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

All concentrations are in ug/L.

**TABLE A.3.3. (cont.)**  
**Volatile Organic Data from First Round of Sampling**

SAMPLE ID	GMP-20 3-28-88	GMP-22 3-28-88	GMP-21 3-28-88	GM-28 3-28-88
REPLICATE OF:		GMP-20		GM-18
<b>PARAMETER</b>				
Chloromethane	<10	<10	<10	<10
Bromomethane	<10	<10	<10	<10
Vinyl Chloride	<10	<10	<10	<10
Chlorethane	<10	<10	<10	<10
Methylene Chloride	<1	<1	<1	<1
1,1-Dichloroethene	52	47	29	<1
1,1-Dichloroethane	3	2	<1	<1
trans 1,2-Dichloroethene	<1	<1	<1	<1
Chloroform	<1	<1	<1	<1
1,2-Dichloroethane	<1	<1	<1	<1
1,1,1-Trichloroethane	140	130	78	<1
Carbon Tetrachloride	<1	<1	<1	<1
Bromodichloromethane	<1	<1	<1	<1
1,2-Dichloropropane	<1	<1	<1	<1
trans 1,3-Dichloropropene	<1	<1	<1	<1
Trichloroethene	190	180	70	<1
Chlorodibromomethane	<1	<1	<1	<1
1,1,2-Trichloroethane	<1	<1	<1	<1
cis 1,3-Dichloropropene	<1	<1	<1	<1
2-Chloroethylvinylether	<10	<10	<10	<10
Bromoform	<10	<10	<10	<10
1,1,2,2-Tetrachloroethane	<1	<1	<1	<1
Tetrachloroethene	41	35	<1	<1
Chlorobenzene	<1	<1	<1	<1
Benzene	<1	<1	<1	<1
Toluene	<1	<1	<1	<1
Ethylbenzene	<1	<1	<1	<1
Xylene (m-)	<1	<1	<1	<1
Xylenes (o-,p-)	<1	<1	<1	<1

All concentrations are in ug/L.

TABLE A.3.4.  
Inorganic Data from First Round of Sampling

WELL ID	REP. OF	SAMPLED	Ag	As	Ba	Cd	Cr	Cr 6	Cu	Hg	Ni	Pb	Se	Zn	pH	SC	DS	SS	Turb. (NTU)
GM-1		03-29-88	<0.01	0.06	<0.5	<0.01	0.39	<0.01	0.05	<0.001	0.07	0.05	<0.005	0.38	4.7	161	143	2020	470
GM-2		03-29-88	<0.01	0.02	<0.5	<0.01	0.14	<0.01	<0.01	<0.001	0.03	<0.02	<0.005	0.09	5.4	130	100	770	470
GM-2F		03-29-88	<0.01	<0.01	<0.5	<0.01	<0.02	<0.01	<0.01	<0.001	<0.02	<0.02	<0.005	0.06	---	---	---	---	---
GM-32	GM-2	03-29-88	<0.01	0.02	<0.5	<0.01	0.15	<0.01	<0.01	<0.001	0.03	<0.02	<0.005	0.10	5.5	130	94	781	480
GM-3		03-29-88	<0.01	0.04	<0.5	<0.01	0.28	<0.01	0.02	<0.001	0.03	<0.02	<0.005	0.11	5.4	68	46	1600	520
GM-3F		03-29-88	<0.01	<0.01	<0.5	<0.01	<0.02	---	<0.01	<0.001	<0.02	<0.02	<0.005	0.02	---	---	---	---	---
GM-4		03-30-88	<0.01	0.02	<0.5	<0.01	0.07	<0.01	<0.01	<0.001	<0.02	<0.02	<0.005	0.03	5.5	25.9	34	522	320
GM-5		03-30-88	<0.01	0.01	<0.5	<0.01	0.05	<0.01	<0.01	<0.001	0.03	<0.02	<0.005	0.03	5.7	75	75	641	220
GM-6		03-29-88	<0.01	<0.01	<0.5	<0.01	<0.02	<0.01	<0.01	<0.001	0.04	<0.02	<0.005	0.10	5.0	62	62	133	51
GM-6F		03-29-88	<0.01	<0.01	<0.5	<0.01	<0.02	---	<0.01	<0.001	0.03	<0.02	<0.005	0.09	---	---	---	---	---
GM-7		03-30-88	<0.01	<0.01	<0.5	<0.01	0.04	<0.01	<0.01	<0.001	<0.02	<0.02	<0.005	0.03	5.4	33	63	202	100
GM-8		03-29-88	<0.01	0.01	<0.5	<0.01	0.11	<0.01	<0.01	<0.001	0.03	<0.03	<0.005	0.06	4.9	130	106	434	190
GM-9		03-29-88	<0.01	<0.01	<0.5	<0.01	<0.02	<0.01	<0.01	<0.001	<0.02	<0.04	<0.005	0.04	6.1	69	63	43	29
GM-10		03-29-88	<0.01	<0.01	<0.5	<0.01	<0.02	<0.01	<0.01	<0.001	0.02	<0.02	<0.005	<0.01	5.8	66	13	43	33
GM-33	GM-10	03-29-88	<0.01	<0.01	<0.5	<0.01	<0.02	<0.01	<0.01	<0.001	<0.02	<0.02	<0.005	<0.01	5.8	63	42	34	22
GM-11		03-30-88	<0.01	0.01	<0.5	<0.01	0.04	<0.01	<0.01	<0.001	<0.02	<0.02	<0.005	0.06	6.6	256	209	133	74
GM-35	GM-11	03-30-88	<0.01	<0.01	<0.5	<0.01	0.04	<0.01	<0.01	<0.001	<0.02	<0.02	<0.005	0.06	7.2	265	192	128	74
GM-12		03-28-88	<0.01	<0.01	<0.5	<0.01	<0.02	<0.01	<0.01	<0.001	<0.02	<0.02	<0.005	0.06	5.9	49	60	68	81
GM-13		03-28-88	<0.01	<0.01	<0.5	<0.01	<0.02	<0.01	<0.01	<0.001	<0.02	<0.02	<0.005	<0.01	5.7	46	64	57	62
GM-14		03-28-88	<0.01	0.01	<0.5	<0.01	<0.02	<0.01	<0.01	<0.001	<0.02	<0.02	<0.005	<0.01	5.1	42	49	42	56
GM-14F		03-28-88	<0.01	<0.01	<0.5	<0.01	<0.02	---	<0.01	<0.001	<0.02	<0.02	<0.005	<0.01	---	---	---	---	---
GM-15		03-28-88	<0.01	<0.01	<0.5	<0.01	<0.02	<0.01	<0.01	<0.001	<0.02	<0.02	<0.005	<0.01	5.1	39.8	60	51	48
GM-18		03-28-88	<0.01	<0.01	<0.5	<0.01	<0.02	<0.01	<0.01	<0.001	<0.02	<0.02	<0.005	<0.01	5.8	71	90	54	37
GM-28	GM-18	03-28-88	<0.01	<0.01	<0.5	<0.01	<0.02	<0.01	<0.01	<0.001	<0.02	<0.02	<0.005	<0.01	5.8	74	88	26	36
GMP-16*		03-28-88	<0.01	0.02	<0.5	<0.01	0.25	<0.01	0.06	<0.001	0.04	<0.02	<0.005	0.07	4.9	40	48	1090	380
GMP-17		03-28-88	<0.01	0.03	<0.5	<0.01	0.18	<0.01	0.06	<0.001	<0.02	<0.02	<0.005	0.06	5.0	49	54	1100	420
GMP-19		03-28-88	<0.01	0.03	<0.5	<0.01	0.29	<0.01	0.08	<0.001	0.04	0.05	<0.005	0.12	4.5	110	87	2030	350
GMP-19F		03-28-88	<0.01	<0.01	<0.5	<0.01	<0.02	---	<0.01	<0.001	<0.02	0.02	<0.005	0.10	---	---	---	---	---
GMP-20		03-28-88	<0.01	0.04	<0.5	<0.01	0.19	<0.01	0.03	<0.001	<0.02	0.03	<0.005	0.09	4.4	100	91	956	380
GMP-22	GMP-20	03-28-88	<0.01	0.04	<0.5	<0.01	0.18	<0.01	0.02	<0.001	0.03	0.03	<0.005	0.08	4.5	110	96	669	300
GMP-21		03-28-88	<0.01	0.08	<0.5	<0.01	0.49	<0.01	0.11	<0.001	0.09	0.08	<0.005	0.42	4.4	380	269	1270	490

Metals, DS and SS are in mg/L. SC units are umhos/cm. \* Filtered sample replicate. --- Parameter not analyzed. \* Appears as GM-16 on chain of custody.

GERAGHTY & MILLER, INC.

## **APPENDIX A.4**

### **Surface Waters Ditch**

**TABLE A.4.1.**  
Volatile Organic Data from Stream and Mini-piezometer Samples

SAMPLE ID	S-1 9-16-87	S-2 9-16-87	S-3 9-16-87	S-4 9-16-87	S-5 9-16-87	S-10 9-16-87 S-5	S-6 (S-7) 9-16-87	S-7 (S-8) 9-16-87	S-8 (S-9) 9-16-87	S-9 (S-10) 9-16-87
<b>REPLICATE OF:</b>										
<b>PARAMETER</b>										
Carbon Tetrachloride	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Chlorobenzene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,2-Dichloroethane	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1,1-Trichloroethane	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1-Dichloroethane	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1,2-Trichloroethane	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1,2,2-Tetrachloroethane	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Chloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
2-Chloroethylvinylether	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chloroform	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1-Dichloroethene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
trans 1,2-Dichloroethene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,2-Dichloropropene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,3-Dichloropropene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Methylene Chloride	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10
Methyl Chloride	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Methyl Bromide	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromoform	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Dichlorobromomethane	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Chlorodibromomethane	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Tetrachloroethene	<1	<1	<1	<2	<3	<6	<6	<6	<6	<6
Trichloroethene	<1	<1	<1	<10	<10	<10	<10	<10	<10	<10
Vinyl Chloride	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10

All concentrations are in ug/L. ( ) indicates corresponding 4-6-87 locations.

**TABLE A.4.1. (cont.)**  
**Volatile Organic Data from Stream and Mini-piezometer Samples**

SAMPLE ID	S-1 4-06-88	S-2 4-06-88	S-3 4-06-88	S-4 4-06-88	S-5 4-06-88	S-6 4-06-88 S-5	S-7 4-06-88	S-8 4-06-88	S-9 4-06-88	S-10 4-06-88
DATE SAMPLED										
REPLICATE OF:										
PARAMETER										
Carbon Tetrachloride	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Chlorobenzene	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
1,2-Dichloroethane	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
1,1,1-Trichloroethane	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
1,1-Dichloroethane	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
1,1,2-Trichloroethane	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
1,1,2,2-Tetrachloroethane	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Chloroethane	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
2-Chloroethylvinylether	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Chloroform	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
1,1-Dichloroethene	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
trans 1,2-Dichloroethene	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
1,2-Dichloropropane	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
1,3-Dichloropropene	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Methylene Chloride	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Methyl Chloride	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Methyl Bromide	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Bromoform	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Dichlorobromomethane	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Chlorodibromomethane	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Tetrachloroethene	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Trichloroethene	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Vinyl Chloride	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲

All concentrations are in ug/L. ( ) indicate corresponding 4-6-87 locations.

**TABLE A.4.1. (cont.)**  
**Volatile Organic Data from Stream and Mini-piezometer Samples**

SAMPLE ID DATE SAMPLED REPLICATE OF:	MP-1 9-21-87	MP-2 9-21-87	MP-3 9-21-87	MP-4 9-21-87	MP-5 9-21-87	MP-12 9-21-87 MP-5	MP-6 9-21-87	MP-7 9-21-87	MP-8 9-21-87	MP-9 9-21-87	MP-10 9-21-87	MP-11 9-21-87
<b>PARAMETER</b>												
Carbon Tetrachloride	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Chlorobenzene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,2-Dichloroethane	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1,1-Trichloroethane	<1	<1	<1	<1	<1	<1	<1	<1	15	<1	<1	<1
1,1-Dichloroethane	<1	<1	<1	<1	<1	<1	<1	<1	14	<1	<1	<1
1,1,2-Trichloroethane	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1,2,2-Tetrachloroethane	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Chloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
2-Chloroethylvinylether	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chloroform	<1	<1	<1	<1	<1	<1	<1	<1	27	<1	<1	<1
1,1-Dichloroethene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
trans 1,2-Dichloroethene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,2-Dichloropropane	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,3-Dichloropropene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Methylene Chloride	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Methyl Chloride	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Methyl Bromide	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromoform	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Dichlorobromomethane	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Chlorodibromomethane	<1	<1	<1	<1	<1	<1	<1	<1	2	<1	<1	<1
Tetrachloroethene	<1	<1	<1	<1	<1	<1	<1	<1	230	<1	<1	<1
Trichloroethene	<1	<1	<1	<1	<1	<1	<1	<10	<10	<10	<10	<10
Vinyl Chloride	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10

All concentrations are in ug/L. ( ) indicates corresponding 4-6-87 locations.

**TABLE A.4.2.**  
Inorganic Data from Stream and Mini-piezometers

SAMPLE ID	REP. OF	SAMPLED	Ag	As	Ba	Cd	Cr	Cr 6	Cu	Hg	Ni	Pb	Se	Zn	pH	SC	DS	SS
S-1	S-5	04-06-87	---	<0.01	<0.5	<0.01	<0.01	<0.01	---	<0.001	---	<0.01	---	---	6.5	108	36	---
S-2		04-06-87	---	<0.01	<0.5	<0.01	<0.01	<0.01	---	<0.001	---	<0.01	---	---	6.7	85	60	---
S-3		04-06-87	---	<0.01	<0.5	<0.01	<0.01	<0.01	---	<0.001	---	<0.01	---	---	6.8	207	143	---
S-4		04-06-87	---	<0.01	<0.5	<0.01	<0.01	<0.01	---	<0.001	---	<0.01	---	---	6.7	207	153	---
S-5		04-06-87	---	<0.01	<0.5	<0.01	<0.01	<0.01	---	<0.001	---	<0.01	---	---	6.9	214	138	---
S-6		04-06-87	---	<0.01	<0.5	<0.01	<0.01	<0.01	---	<0.001	---	<0.01	---	---	6.8	209	130	---
S-7		04-06-87	---	<0.01	<0.5	<0.01	<0.01	<0.01	---	<0.001	---	<0.01	---	---	6.8	91	92	---
S-8		04-06-87	---	<0.01	<0.5	<0.01	<0.01	<0.01	---	<0.001	---	<0.01	---	---	6.8	200	173	---
S-9		04-06-87	---	<0.01	<0.5	<0.01	<0.01	<0.01	---	<0.001	---	<0.01	---	---	5.9	60	46	---
S-10		04-06-87	---	<0.01	<0.5	<0.01	<0.01	<0.01	---	<0.001	---	<0.01	---	---	6.7	263	114	---
S-10F		04-06-87	---	<0.01	<0.5	<0.01	<0.01	<0.01	---	<0.001	---	<0.01	---	---	6.8	265	183	---
S-1	S-5	09-16-87	<0.01	<0.01	<0.5	<0.01	<0.01	<0.01	<0.01	<0.001	<0.01	<0.01	<0.02	<0.01	7.5	124	75	5
S-2		09-16-87	<0.01	<0.01	<0.5	<0.01	<0.01	<0.01	<0.01	<0.001	<0.01	<0.01	<0.02	<0.01	7.6	82	56	4
S-3		09-16-87	<0.01	<0.01	<0.5	<0.01	<0.01	<0.01	<0.01	<0.001	<0.01	<0.01	<0.02	<0.01	7.4	185	140	<1
S-4		09-16-87	<0.01	<0.01	<0.5	<0.01	<0.01	<0.01	<0.01	<0.001	<0.01	<0.01	<0.02	<0.01	7.3	195	139	2
S-5		09-16-87	<0.01	<0.01	<0.5	<0.01	<0.01	<0.01	<0.01	<0.001	<0.01	<0.01	<0.02	<0.01	7.2	195	138	17
S-10		09-16-87	<0.01	<0.01	<0.5	<0.01	<0.01	<0.01	<0.01	<0.001	<0.01	<0.01	<0.02	<0.01	7.1	188	125	14
S-6 (S-7)		09-16-87	<0.01	<0.01	<0.5	<0.01	<0.01	<0.01	<0.01	<0.001	<0.01	<0.01	<0.02	<0.01	7.3	103	58	42
S-7 (S-8)		09-16-87	<0.01	<0.01	<0.5	<0.01	<0.01	<0.01	<0.01	<0.001	<0.01	<0.01	<0.02	<0.01	7.2	195	143	4
S-8 (S-9)		09-16-87	<0.01	<0.01	<0.5	<0.01	<0.01	<0.01	<0.01	<0.001	<0.01	<0.01	<0.02	<0.01	7.1	138	87	17
S-9 (S-10)		09-16-87	<0.01	<0.01	<0.5	<0.01	<0.01	<0.01	<0.01	<0.001	<0.01	<0.01	<0.02	<0.01	7.1	215	106	5
MP-1	MP-5	09-21-87	---	---	---	---	---	---	---	---	---	---	---	---	6.3	380	85	---
MP-2		09-21-87	---	---	---	---	---	---	---	---	---	---	---	---	6.2	175	89	---
MP-3		09-21-87	---	---	---	---	---	---	---	---	---	---	---	---	6.2	129	36	---
MP-4		09-21-87	---	---	---	---	---	---	---	---	---	---	---	---	5.9	340	153	---
MP-5		09-21-87	---	---	---	---	---	---	---	---	---	---	---	---	5.9	290	125	---
MP-12		09-21-87	---	---	---	---	---	---	---	---	---	---	---	---	5.7	280	147	---
MP-6		09-21-87	---	---	---	---	---	---	---	---	---	---	---	---	5.6	41	30	---
MP-7		09-21-87	---	---	---	---	---	---	---	---	---	---	---	---	5.6	45	50	---
MP-8		09-21-87	---	---	---	---	---	---	---	---	---	---	---	---	6.1	97	43	---
MP-9		09-21-87	---	---	---	---	---	---	---	---	---	---	---	---	5.6	48	64	---
MP-10		09-22-87	---	---	---	---	---	---	---	---	---	---	---	---	5.4	32	55	---
MP-11		09-21-87	---	---	---	---	---	---	---	---	---	---	---	---	5.0	48	65	---

Metals, SS, DS, Alk and anions values are in mg/L. SC is in umhos/cm. --- Parameter not analyzed. ( ) are for 4-6-87 locations.

TABLE A.4.2. (cont.)  
Inorganic Data from Stream and Mini-piezometers

SAMPLE ID	REP. OF	Alk	Ca	Cl	Fe	K	Mg	Mn	Na	NO3	SO4	F
S-1	S-5	---	---	---	---	---	---	---	0.2	---	<0.2	
S-2		---	---	---	---	---	---	---	0.1	---	<0.2	
S-3		---	---	---	---	---	---	---	0.4	---	<0.2	
S-4		---	---	---	---	---	---	---	0.4	---	<0.2	
S-5		---	---	---	---	---	---	---	0.4	---	<0.2	
S-6		---	---	---	---	---	---	---	0.4	---	<0.2	
S-7		---	---	---	---	---	---	---	<0.1	---	<0.2	
S-8		---	---	---	---	---	---	---	0.4	---	<0.2	
S-9		---	---	---	---	---	---	---	<0.1	---	<0.2	
S-10		---	---	---	---	---	---	---	0.5	---	<0.2	
S-10F		---	---	---	---	---	---	---	0.5	---	<0.2	
S-1	S-5	19	8.2	15	1.79	3.0	2.8	0.11	6.5	0.1	7	---
S-2		17	5.7	10	1.06	3.0	2.3	0.07	4.9	<0.1	7	---
S-3		36	17.2	33	1.21	3.8	4.1	0.10	13.3	0.4	7	---
S-4		35	17.5	33	1.35	3.7	4.0	0.12	13.3	0.4	7	---
S-5		36	17.6	33	1.55	3.8	4.1	0.14	13.2	0.4	7	---
S-10		37	17.0	32	1.52	3.8	4.0	0.14	13.1	0.3	7	---
S-6 (S-7)		20	7.4	15	4.37	3.7	5.4	0.08	4.0	<0.1	7	---
S-7 (S-8)		37	17.7	33	1.33	3.9	4.1	0.15	13.1	0.4	8	---
S-8 (S-9)		26	9.4	23	3.85	3.3	2.6	0.11	7.5	0.3	7	---
S-9 (S-10)		38	19.7	37	2.11	4.1	4.4	0.19	14.6	0.5	8	---
MP-1	MP-5	---	---	---	---	---	---	---	---	---	---	---
MP-2		---	---	---	---	---	---	---	---	---	---	---
MP-3		---	---	---	---	---	---	---	---	---	---	---
MP-4		---	---	---	---	---	---	---	---	---	---	---
MP-5		---	---	---	---	---	---	---	---	---	---	---
MP-12		---	---	---	---	---	---	---	---	---	---	---
MP-6		---	---	---	---	---	---	---	---	---	---	---
MP-7		---	---	---	---	---	---	---	---	---	---	---
MP-8		---	---	---	---	---	---	---	---	---	---	---
MP-9		---	---	---	---	---	---	---	---	---	---	---
MP-10		---	---	---	---	---	---	---	---	---	---	---
MP-11		---	---	---	---	---	---	---	---	---	---	---

Metals, SS, DS, Alk and anions values are in mg, SC is in umhos/cm. --- Parameter not analyzed. ( ) are for 4-6-87 locations.

**TABLE A.4.3.**  
Volatile Organic Data from Ditch and Seeps

SAMPLE ID DATE SAMPLED REPLICATE OF:	D-16* 3-2-88	D-18* 3-2-88	D-20* 3-2-88	D-22* 3-2-88	D-24* 3-2-88	D-26* 3-2-88	D-27* 3-2-88	SE-1 3-2-88	SE-2 3-2-88	MB-1 4-3-87	MB-3 4-3-87
<b>PARAMETER</b>											
Carbon Tetrachloride	<1	<1	<1	<1	<10	<10	<10	<1	<1	<0.5	<0.5
Chlorobenzene	<1	<1	<1	<1	<10	<10	<10	<1	<1	<0.5	<0.5
1,2-Dichloroethane	<1	<1	<1	<1	<10	<10	<10	<1	<1	<0.5	<0.5
1,1,1-Trichloroethane	12	10	47	110	420	1800	2300	<1	<1	<0.5	<0.5
1,1-Dichloroethane	<1	<1	<1	5	16	59	69	<1	<1	<0.5	<0.5
1,1,2-Trichloroethane	<1	<1	<1	<1	<10	<10	<10	<1	<1	<0.5	<0.5
1,1,2,2-Tetrachloroethane	<1	<1	<1	<1	<10	<10	<10	<1	<1	<0.5	<0.5
Chloroethane	<10	<10	<10	<10	<100	<10	<10	<10	<10	<0.5	<0.5
2-Chloroethylvinylether	<10	<10	<10	<10	<100	<10	<10	<10	<10	<0.5	<0.5
Chloroform	<1	<1	<1	<1	<10	<10	<10	<1	<1	<0.5	<0.5
1,1-Dichloroethene	2	1	18	39	160	740	920	<1	<1	<0.5	<0.5
trans 1,2-Dichloroethene	<1	<1	<1	<1	<10	<10	<10	<1	<1	<0.5	<0.5
1,2-Dichloropropane	<1	<1	<1	<1	<10	<10	<10	<1	<1	<0.5	<0.5
1,3-Dichloropropene	<1	<1	<1	<1	<10	<10	<10	<1	<1	..	..
Methylene Chloride	<1	<1	<1	<1	<10	<10	<10	<1	<1	<0.5	<0.5
Chloromethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<0.5	<0.5
Bromomethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<0.5	<0.5
Bromoform	<1	<1	<1	<1	<10	<10	<10	<1	<1	<0.5	<0.5
Bromodichloromethane	<1	<1	<1	<1	<10	<10	<10	<1	<1	<0.5	<0.5
Dibromochloromethane	<1	<1	<1	<1	<10	<10	<10	<1	<1	<0.5	<0.5
Tetrachloroethene	1	<1	4	14	56	300	540	<1	<1	<0.5	<0.5
Trichloroethene	38	32	120	280	1200	5000	5700	<1	<1	<0.5	<0.5
Vinyl Chloride	<10	<10	<10	<10	<10	21	<10	<10	<10	<0.5	<0.5
Dichlorofluoromethane	..	..	..	..	..	..	..	..	..	..	<0.5
Trichlorofluoromethane	..	..	..	..	..	..	..	..	..	..	<0.5
trans 1,3-Dichloropropene	..	..	..	..	..	..	..	..	..	..	<0.5
cis 1,3-Dichloropropene	..	..	..	..	..	..	..	..	..	..	<0.5
1,3-Dichlorobenzene	..	..	..	..	..	..	..	..	..	..	<0.5
1,2-Dichlorobenzene	..	..	..	..	..	..	..	..	..	..	<0.5
1,4-Dichlorobenzene	..	..	..	..	..	..	..	..	..	..	<0.5

All concentrations are in ug/L. \* Appear as MP-16, MP-18, MP-20, etc... on chain of custody and certificate of analysis. --- Parameter not analyzed.

GERAGHTY & MILLER, INC.

## **APPENDIX A.5**

### **Borings Adjacent to Drywells and Septic Tanks/Pit**

**TALBE A.5.1.**  
Volatile Organic Data from Drywell Borings

SAMPLE ID	DWB-4-5	DWB-4-10	DWB-4-15	DWB-4-20	DWB-4-25	DWB-4-30	DWB-4-35	DWB-4-40	DWB-4-45	DWB-4-60	DWB-4-50	DWB-4-55
DATE SAMPLED	10-15-87	10-15-87	10-15-87	10-15-87	10-15-87	10-15-87	10-15-87	10-15-87	10-15-87	10-15-87	10-15-87	10-15-87
REPLICATE OF:												
<b>PARAMETER</b>												
Benzene	5	5	5	5	5	5	5	5	5	5	5	5
Carbon Tetrachloride	5	5	5	5	5	5	5	5	5	5	5	5
Chlorobenzene	5	5	5	5	5	5	5	5	5	5	5	5
1,2-Dichloroethane	5	5	5	5	5	5	5	5	5	5	5	5
1,1,1-Trichloroethane	5	5	5	5	5	5	5	5	5	5	5	5
1,1-Dichloroethane	5	5	5	5	5	5	5	5	5	5	5	5
1,1,2-Trichloroethane	5	5	5	5	5	5	5	5	5	5	5	5
1,1,2,2-Tetrachloroethane	5	5	5	5	5	5	5	5	5	5	5	5
Chloroethane	<10	5	5	5	5	5	5	5	5	5	5	5
2-Chloroethylvinylether	5	5	5	5	5	5	5	5	5	5	5	5
Chloroform	5	5	5	5	5	5	5	5	5	5	5	5
1,1-Dichloroethene	5	5	5	5	5	5	5	5	5	5	5	5
trans 1,2-Dichloroethene	5	5	5	5	5	5	5	5	5	5	5	5
1,2-Dichloropropane	5	5	5	5	5	5	5	5	5	5	5	5
trans 1,3-Dichloropropene	5	5	5	5	5	5	5	5	5	5	5	5
Ethylbenzene	5	5	5	5	5	5	5	5	5	5	5	5
Methylene Chloride	98*	245*	5	5	5	5	5	5	5	5	5	132*
Chloromethane	<10	<10	5	5	5	5	5	5	5	5	5	<10
Bromomethane	<10	<10	5	5	5	5	5	5	5	5	5	<10
Bromoform	5	5	5	5	5	5	5	5	5	5	5	5
Bromodichloromethane	5	5	5	5	5	5	5	5	5	5	5	5
Dibromochloromethane	5	5	5	5	5	5	5	5	5	5	5	5
Tetrachloroethene	5	5	5	5	5	5	5	5	5	5	5	5
Toluene	5	5	5	5	5	5	5	5	5	5	5	5
Trichloroethene	6**	19**	5	5	5	5	5	5	5	5	5	7**
Vinyl Chloride	<10	<10	5	5	5	5	5	5	5	5	5	<10
Trichlorofluoromethane	5	5	5	5	5	5	5	5	5	5	5	5
cis 1,3-Dichloropropene	5	5	5	5	5	5	5	5	5	5	5	5
Xylenes (total)	5	5	5	5	5	5	5	5	5	5	5	5

All concentrations are in ug/Kg.

TABLE A.5.1. (cont.)  
Volatile Organic Data from Drywell Borings

SAMPLE ID	DWB-5-5 10-16-87	DWB-5-10 10-16-87	DWB-5-15 10-16-87	DWB-5-20 10-16-87	DWB-5-25 10-16-87	DWB-5-30 10-16-87	DWB-5-35 10-16-87	DWB-5-40 10-16-87	DWB-5-45 10-16-87	DWB-5-50 10-16-87	DWB-5-60 10-16-87	DWB-5-55 10-16-87	
REPLICATE OF:													
<b>PARAMETER</b>													
Benzene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Carbon Tetrachloride	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Chlorobenzene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,2-Dichloroethane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,1,1-Trichloroethane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,1-Dichloroethane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,1,2-Trichloroethane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,1,2,2-Tetrachloroethane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Chloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
2-Chloroethylvinylether	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Chloroform	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,1-Dichloroethene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
trans 1,2-Dichloroethene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,2-Dichloropropane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
trans 1,3-Dichloropropene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Ethylbenzene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Methylene Chloride	171*	163*	154*	142*	200*	192*	175*	148*	203*	87*	76*	91*	<10
Chloromethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromomethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromoform	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Bromodichloromethane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Dibromochloromethane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Tetrachlorothene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Toluene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Trichloroethene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Vinyl Chloride	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Trichlorofluoromethane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
cis 1,3-Dichloropropene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Xylenes (total)	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5

All concentrations are in ug/Kg.

**TABLE A.5.1. (cont.)**  
**Volatile Organic Data from Drywell Borings**

SAMPLE ID	DWB-7-5 10-29-87	DWB-7-10 10-29-87	DWB-7-15 10-29-87	DWB-7-20 10-29-87	DWB-7-25 10-29-87	DWB-7-30 10-29-87	DWB-7-35 10-29-87	DWB-7-40 10-29-87	DWB-7-55 10-29-87	DWB-7-45 10-29-87	DWB-7-50 10-29-87
DATE SAMPLED											
REPLICATE OF:											
<b>PARAMETER</b>											
Benzene	5	5	5	5	5	5	5	5	5	5	5
Carbon Tetrachloride	5	5	5	5	5	5	5	5	5	5	5
Chlorobenzene	5	5	5	5	5	5	5	5	5	5	5
1,2-Dichloroethane	5	5	5	5	5	5	5	5	5	5	5
1,1,1-Trichloroethane	5	5	5	5	5	5	5	5	5	5	5
1,1-Dichloroethane	5	5	5	5	5	5	5	5	5	5	5
1,1,2-Trichloroethane	5	5	5	5	5	5	5	5	5	5	5
1,1,2,2-Tetrachloroethane	5	5	5	5	5	5	5	5	5	5	5
Chloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
2-Chloroethylvinylether	5	5	5	5	5	5	5	5	5	5	5
Chloroform	5	5	5	5	5	5	5	5	5	5	5
1,1-Dichloroethene	5	5	5	5	5	5	5	5	5	5	5
trans 1,2-Dichloroethene	5	5	5	5	5	5	5	5	5	5	5
1,2-Dichloropropane	5	5	5	5	5	5	5	5	5	5	5
trans 1,3-Dichloropropene	5	5	5	5	5	5	5	5	5	5	5
Ethylbenzene	5	5	5	5	5	5	5	5	5	5	5
Methylene Chloride	50*	46*	13*	18*	7*	7*	7*	7*	31*	28*	38*
Chloromethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromomethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromoform	5	5	5	5	5	5	5	5	5	5	5
Bromodichloromethane	5	5	5	5	5	5	5	5	5	5	5
Dibromochloromethane	5	5	5	5	5	5	5	5	5	5	5
Tetrachloroethene	5	5	5	5	5	5	5	5	5	5	5
Toluene	5	5	5	5	5	5	5	5	5	5	5
Trichloroethene	5	5	5	5	5	5	5	5	5	5	5
Vinyl Chloride	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Trichlorofluoromethane	5	5	5	5	5	5	5	5	5	5	5
cis 1,3-Dichloropropene	5	5	5	5	5	5	5	5	5	5	5
Xylenes (total)	5	5	5	5	5	5	5	5	5	5	5

All concentrations are in ug/Kg.

TABLE A.5.1. (cont.)  
Volatile Organic Data from Drywell Borings

SAMPLE ID	DWB-8-3	DWB-8-8	DWB-8-13	DWB-8-18	DWB-8-23	DWB-8-28	DWB-8-33	DWB-8-38	DWB-8-43	DWB-8-48	DWB-8-48	DWB-8-53'
DATE SAMPLED	10-23-87	10-23-87	10-23-87	10-23-87	10-23-87	10-23-87	10-23-87	10-23-87	10-23-87	10-23-87	10-26-87	10-26-87
REPLICATE OF:												DWB-8-43
<b>PARAMETER</b>												
Benzene	5	5	5	5	5	5	5	5	5	5	5	5
Carbon Tetrachloride	5	5	5	5	5	5	5	5	5	5	5	5
Chlorobenzene	5	5	5	5	5	5	5	5	5	5	5	5
1,2-Dichloroethane	5	5	5	5	5	5	5	5	5	5	5	5
1,1,1-Trichloroethane	5	5	5	5	5	5	5	5	5	5	5	5
1,1-Dichloroethane	5	5	5	5	5	5	5	5	5	5	5	5
1,1,2-Trichloroethane	5	5	5	5	5	5	5	5	5	5	5	5
1,1,2,2-Tetrachloroethane	5	5	5	5	5	5	5	5	5	5	5	5
Chloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
2-Chloroethylvinylether	5	5	5	5	5	5	5	5	5	5	5	5
Chloroform	5	5	5	5	5	5	5	5	5	5	5	5
1,1-Dichloroethene	5	5	5	5	5	5	5	5	5	5	5	5
trans 1,2-Dichloroethene	5	5	5	5	5	5	5	5	5	5	5	5
1,2-Dichloropropane	5	5	5	5	5	5	5	5	5	5	5	5
trans 1,3-Dichloropropene	5	5	5	5	5	5	5	5	5	5	5	5
Ethylbenzene	5	5	5	5	5	5	5	5	5	5	5	5
Methylene Chloride	29*	28*	28*	27*	70*	71*	259*	167*	10	10	10	23*
Chloromethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromomethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromoform	5	5	5	5	5	5	5	5	5	5	5	5
Bromodichloromethane	5	5	5	5	5	5	5	5	5	5	5	5
Dibromochloromethane	5	5	5	5	5	5	5	5	5	5	5	5
Tetrachlorothene	5	39	7.0	10	10	10	10	10	10	10	10	10
Toluene	5	5	5	5	5	5	5	5	5	5	5	5
Trichloroethene	5	5	5	5	5	5	5	5	5	5	5	5
Vinyl Chloride	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Trichlorofluoromethane	5	5	5	5	5	5	5	5	5	5	5	5
cis 1,3-Dichloropropene	5	5	5	5	5	5	5	5	5	5	5	5
Xylenes (total)	5	5	5	5	5	5	5	5	5	5	5	5

All concentrations are in ug/Kg.

**TABLE A.5.1. (cont.)**  
Volatile Organic Data from Drywell Borings

SAMPLE ID	DWB-9D-54	DWB-9D-59	DWB-9D-64	DWB-9D-69	DWB-9D-74	DWB-9D-99	DWB-9D-79	DWB-9D-84	DWB-9D-89	DWB-9D-94
DATE SAMPLED	11-03-87	11-03-87	11-03-87	11-03-87	11-03-87	11-03-87	11-03-87	11-03-87	11-03-87	11-03-87
REPLICATE OF:					DWB-9D-74					
<b>PARAMETER</b>										
Benzene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Carbon Tetrachloride	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Chlorobenzene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,2-Dichloroethane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,1,1-Trichloroethane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,1-Dichloroethane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,1,2-Trichloroethane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,1,2,2-Tetrachloroethane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Chloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
2-Chloroethylvinylether	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Chloroform	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,1-Dichloroethene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
trans 1,2-Dichloroethene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,2-Dichloropropane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
trans 1,3-Dichloropropene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Ethylbenzene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Methylene Chloride	9*	14*	14*	13*	13*	13*	12*	11*	11*	12*
Chloromethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromomethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromoform	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Bromodichloromethane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Dibromochloromethane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Tetrachlorothene	13	13	32	39	8	6	10	10	10	150
Toluene	<5	<5	<5	<5	<5	<5	<5	<5	<5	390
Trichloroethene	<5	<5	24	58	<5	<5	<5	<5	<5	<10
Vinyl Chloride	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Trichlorofluoromethane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
cis 1,3-Dichloropropene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Xylenes (total)	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5

All concentrations are in ug/Kg.

TABLE A.5.1. (cont.)  
Volatile Organic Data from Drywell Borings

SAMPLE ID	DWB-9D-4	DWB-9D-9	DWB-9D-14	DWB-9D-19	DWB-9D-24	DWB-9D-29	DWB-9D-1	DWB-9D-34	DWB-9D-39	DWB-9D-44	DWB-9D-49
DATE SAMPLED	11-02-87	11-02-87	11-02-87	11-02-87	11-02-87	11-03-87	11-03-87	11-03-87	11-03-87	11-03-87	11-03-87
REPLICATE OF:						DWB-9D-29					
<b>PARAMETER</b>											
Benzene	5	5	5	5	5	5	5	5	5	5	5
Carbon Tetrachloride	5	5	5	5	5	5	5	5	5	5	5
Chlorobenzene	5	5	5	5	5	5	5	5	5	5	5
1,2-Dichloroethane	5	5	5	5	5	5	5	5	5	5	5
1,1,1-Trichloroethane	5	5	5	5	5	5	5	5	5	5	5
1,1-Dichloroethane	5	5	5	5	5	5	5	5	5	5	5
1,1,2-Trichloroethane	5	5	5	5	5	5	5	5	5	5	5
1,1,2,2-Tetrachloroethane	5	5	5	5	5	5	5	5	5	5	5
Chloroethane	5	5	5	5	5	5	5	5	5	5	5
2-Chloroethylvinylether	5	5	5	5	5	5	5	5	5	5	5
Chloroform	5	5	5	5	5	5	5	5	5	5	5
1,1-Dichloroethene	5	5	5	5	5	5	5	5	5	5	5
trans 1,2-Dichloroethene	5	5	5	5	5	5	5	5	5	5	5
1,2-Dichloropropane	5	5	5	5	5	5	5	5	5	5	5
trans 1,3-Dichloropropene	5	5	5	5	5	5	5	5	5	5	5
Ethylbenzene	5	5	5	5	5	5	5	5	5	5	5
Methylene Chloride	37*	22*	28*	40*	88*	91*	91*	9*	93*	81*	18*
Chloromethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromomethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromoform	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromodichloromethane	5	5	5	5	5	5	5	5	5	5	5
Dibromochloromethane	5	5	5	5	5	5	5	5	5	5	5
Tetrachloroethene	5	5	5	5	5	5	5	5	16	5	5
Toluene	5	5	5	5	5	5	5	5	30	5	5
Trichloroethene	5	5	5	5	5	5	5	5	5	5	5
Vinyl Chloride	5	5	5	5	5	5	5	5	5	5	5
Trichlorofluoromethane	5	5	5	5	5	5	5	5	5	5	5
cis 1,3-Dichloropropene	5	5	5	5	5	5	5	5	5	5	5
Xylenes (total)	5	5	5	5	5	5	5	5	5	5	5

All concentrations are in ug/Kg.

TABLE A.5.1. (cont.)  
Volatile Organic Data from Drywell Borings

SAMPLE ID	DWB-9U-55	DWB-9U-60	DWB-9U-65	DWB-9U-70	DWB-9U-75	DWB-9U-80	DWB-9U-85	DWB-9U-90	DWB-9U-100	DWB-9U-95
DATE SAMPLED	10-30-87	10-30-87	10-30-87	11-02-87	11-02-87	11-02-87	11-02-87	11-02-87	11-02-87	11-02-87
REPLICATE OF:										DWB-9U-90
<b>PARAMETER</b>										
Benzene	5	5	5	5	5	5	5	5	5	5
Carbon Tetrachloride	5	5	5	5	5	5	5	5	5	5
Chlorobenzene	5	5	5	5	5	5	5	5	5	5
1,2-Dichloroethane	5	5	5	5	5	5	5	5	5	5
1,1,1-Trichloroethane	5	5	5	5	5	5	5	5	5	5
1,1-Dichloroethane	5	5	5	5	5	5	5	5	5	5
1,1,2-Trichloroethane	5	5	5	5	5	5	5	5	5	5
1,1,2,2-Tetrachloroethane	5	5	5	5	5	5	5	5	5	10
Chloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
2-Chloroethylvinylether	5	5	5	5	5	5	5	5	5	5
Chloroform	5	5	5	5	5	5	5	5	5	5
1,1-Dichloroethene	5	5	5	5	5	5	5	5	5	5
trans 1,2-Dichloroethene	5	5	5	5	5	5	5	5	5	5
1,2-Dichloropropane	5	5	5	5	5	5	5	5	5	5
trans 1,3-Dichloropropene	5	5	5	5	5	5	5	5	5	5
Ethylbenzene	5	5	5	5	5	5	5	5	5	5
Methylene Chloride	84*	82*	69*	31*	15*	15*	15*	23*	26*	25*
Chloromethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromomethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromoform	5	5	5	5	5	5	5	5	5	5
Bromodichloromethane	5	5	5	5	5	5	5	5	5	5
Dibromochloromethane	5	5	5	5	5	5	5	5	5	5
Tetrachloroethene	10	13	14	5	8	8	5*	20*	14	10
Toluene	5	5	5	5	5	5	5	5	5	5
Trichloroethene	5	5	5	5	5	5	5	5	5	5
Vinyl Chloride	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Trichlorofluoromethane	5	5	5	5	5	5	5	5	5	5
cis 1,3-Dichloropropene	5	5	5	5	5	5	5	5	5	5
Xylenes (total)	5	5	5	5	5	5	5	5	5	5

All concentrations are in ug/Kg.

**TABLE A.5.1. (cont.)**  
**Volatile Organic Data from Drywell Borings**

SAMPLE ID	DWB-9U-5	DWB-9U-10	DWB-9U-15	DWB-9U-20	DWB-9U-25	DWB-9U-30	DWB-9U-35	DWB-9U-40	DWB-9U-45	DWB-9U-0	DWB-9U-50
DATE SAMPLED	10-30-87	10-30-87	10-30-87	10-30-87	10-30-87	10-30-87	10-30-87	10-30-87	10-30-87	10-30-87	10-30-87
REPLICATE OF:											DWB-9U-45
<b>PARAMETER</b>											
Benzene	5	5	5	5	5	5	5	5	5	5	5
Carbon Tetrachloride	5	5	5	5	5	5	5	5	5	5	5
Chlorobenzene	5	5	5	5	5	5	5	5	5	5	5
1,2-Dichloroethane	5	5	5	5	5	5	5	5	5	5	5
1,1,1-Trichloroethane	5	5	5	5	5	5	5	5	5	5	5
1,1-Dichloroethane	5	5	5	5	5	5	5	5	5	5	5
1,1,2-Trichloroethane	5	5	5	5	5	5	5	5	5	5	5
1,1,2,2-Tetrachloroethane	5	5	5	5	5	5	5	5	5	5	5
Chloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
2-Chloroethylvinylether	5	5	5	5	5	5	5	5	5	5	5
Chloroform	5	5	5	5	5	5	5	5	5	5	5
1,1-Dichloroethene	5	5	5	5	5	5	5	5	5	5	5
trans 1,2-Dichloroethene	5	5	5	5	5	5	5	5	5	5	5
1,2-Dichloropropane	5	5	5	5	5	5	5	5	5	5	5
trans 1,3-Dichloropropene	5	5	5	5	5	5	5	5	5	5	5
Ethylbenzene	5	5	5	5	5	5	5	5	5	5	5
Methylene Chloride	9*	16*	95*	91*	88*	83*	65*	40*	78*	<10	<10
Chloromethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromomethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromoform	5	5	5	5	5	5	5	5	5	5	5
Bromodichloromethane	5	5	5	5	5	5	5	5	5	5	5
Dibromochloromethane	5	5	5	5	5	5	5	5	5	5	5
Tetrachloroethene	5	5	5	5	5	5	5	5	5	5	5
Toluene	5	5	5	5	5	5	5	5	5	5	5
Trichloroethene	5	5	5	5	5	5	5	5	5	5	5
Vinyl Chloride	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Trichlorofluoromethane	5	5	5	5	5	5	5	5	5	5	5
cis 1,3-Dichloropropene	5	5	5	5	5	5	5	5	5	5	5
Xylenes (total)	5	5	5	5	5	5	5	5	5	5	5

All concentrations are in ug/Kg.

TABLE A.5.1. (cont.)  
Volatile Organic Data from Drywell Borings

SAMPLE ID	DWB-10-4	DWB-10-9	DWB-10-14	DWB-10-19	DWB-10-24	DWB-10-29	DWB-10-34	DWB-10-39	DWB-10-44	DWB-10-59	DWB-10-49	DWB-10-54
DATE SAMPLED	10-16-87	10-16-87	10-16-87	10-16-87	10-16-87	10-16-87	10-16-87	10-19-87	10-19-87	10-19-87	10-19-87	10-19-87
REPLICATE OF:									DWB-10-44			
<b>PARAMETER</b>												
Benzene	5	5	5	5	5	5	5	5	5	5	5	5
Carbon Tetrachloride	5	5	5	5	5	5	5	5	5	5	5	5
Chlorobenzene	5	5	5	5	5	5	5	5	5	5	5	5
1,2-Dichloroethane	5	5	5	5	5	5	5	5	5	5	5	5
1,1,1-Trichloroethane	5	5	5	5	5	5	5	5	5	5	5	5
1,1-Dichloroethane	5	5	5	5	5	5	5	5	5	5	5	5
1,1,2-Trichloroethane	5	5	5	5	5	5	5	5	5	5	5	5
1,1,2,2-Tetrachloroethane	5	5	5	5	5	5	5	5	5	5	5	5
Chloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
2-Chloroethylvinylether	5	5	5	5	5	5	5	5	5	5	5	5
Chloroform	5	5	5	5	5	5	5	5	5	5	5	5
1,1-Dichloroethene	5	5	5	5	5	5	5	5	5	5	5	5
trans 1,2-Dichloroethene	5	5	5	5	5	5	5	5	5	5	5	5
1,2-Dichloropropane	5	5	5	5	5	5	5	5	5	5	5	5
trans 1,3-Dichloropropene	5	5	5	5	5	5	5	5	5	5	5	5
Ethylbenzene	5	5	5	5	5	5	5	5	5	5	5	5
Methylene Chloride	84*	72*	66*	96*	78*	83*	77*	55*	72*	13*	65*	18*
Chloromethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromomethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromoform	5	5	5	5	5	5	5	5	5	5	5	5
Bromodichloromethane	5	5	5	5	5	5	5	5	5	5	5	5
Dibromochloromethane	5	5	5	5	5	5	5	5	5	5	5	5
Tetrachlorothene	5	5	5	5	5	5	5	5	5	5	5	5
Toluene	5	5	5	5	5	5	5	5	5	5	5	5
Trichloroethene	11	10	10	10	10	7.7	5	5	5	5	5	5
Vinyl Chloride	5	5	5	5	5	5	5	5	5	5	5	5
Trichlorofluoromethane	5	5	5	5	5	5	5	5	5	5	5	5
cis 1,3-Dichloropropene	5	5	5	5	5	5	5	5	5	5	5	5
Xylenes (total)	5	5	5	5	5	5	5	5	5	5	5	5

All concentrations are in ug/Kg.

TABLE A.5.1. (cont.)  
Volatile Organic Data from Drywell Borings

SAMPLE ID	DWB-11-5 10-22-87	DWB-11-10 10-22-87	DWB-11-15 10-22-87	DWB-11-20 10-22-87	DWB-11-25 10-22-87	DWB-11-30 10-22-87	DWB-11-35 10-22-87	DWB-11-40 10-22-87	DWB-11-60 10-22-87	DWB-11-45 10-22-87	DWB-11-50 10-22-87	DWB-11-55 10-22-87
REPLICATE OF:									DWB-11-40			
<hr/>												
PARAMETER												
Benzene	5	5	5	5	5	5	5	5	5	5	5	5
Carbon Tetrachloride	5	5	5	5	5	5	5	5	5	5	5	5
Chlorobenzene	5	5	5	5	5	5	5	5	5	5	5	5
1,2-Dichloroethane	5	5	5	5	5	5	5	5	5	5	5	5
1,1,1-Trichloroethane	5	5	5	5	5	5	5	5	5	5	5	5
1,1-Dichloroethane	5	5	5	5	5	5	5	5	5	5	5	5
1,1,2-Trichloroethane	5	5	5	5	5	5	5	5	5	5	5	5
1,1,2,2-Tetrachloroethane	5	5	5	5	5	5	5	5	5	5	5	5
Chloroethane	<10	5	5	5	5	5	5	5	5	5	5	5
2-Chloroethylvinylether	5	5	5	5	5	5	5	5	5	5	5	5
Chloroform	5	5	5	5	5	5	5	5	5	5	5	5
1,1-Dichloroethene	5	5	5	5	5	5	5	5	5	5	5	5
trans 1,2-Dichloroethene	5	5	5	5	5	5	5	5	5	5	5	5
1,2-Dichloropropane	5	5	5	5	5	5	5	5	5	5	5	5
trans 1,3-Dichloropropene	5	5	5	5	5	5	5	5	5	5	5	5
Ethylbenzene	5	5	5	5	5	5	5	5	5	5	5	5
Methylene Chloride	48*	48*	5	5	5	5	5	5	38*	28*	32*	29*
Chloromethane	<10	<10	<10	45*	45*	45*	42*	<10	<10	<10	<10	<10
Bromomethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromoform	5	5	5	5	5	5	5	5	5	5	5	5
Bromodichloromethane	5	5	5	5	5	5	5	5	5	5	5	5
Dibromochloromethane	5	5	5	5	5	5	5	5	5	5	5	5
Tetrachlorothene	5	5	5	5	5	5	5	5	5	5	5	5
Toluene	5	5	5	5	5	5	5	5	5	5	5	5
Trichloroethene	5	5	5	5	5	5	5	5	5	5	5	5
Vinyl Chloride	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Trichlorofluoromethane	5	5	5	5	5	5	5	5	5	5	5	5
cis 1,3-Dichloropropene	5	5	5	5	5	5	5	5	5	5	5	5
Xylenes (total)	5	5	5	5	5	5	5	5	5	5	5	5

All concentrations are in ug/Kg.

TABLE A.5.1. (cont.)  
Volatile Organic Data from Drywell Borings

SAMPLE ID	DWB-12-5	DWB-12-10	DWB-12-15	DWB-12-20	DWB-12-25	DWB-12-30	DWB-12-35	DWB-12-40	DWB-12-50	DWB-12-45
DATE SAMPLED	10-27-87	10-27-87	10-27-87	10-27-87	10-27-87	10-27-87	10-27-87	10-27-87	10-27-87	10-27-87
REPLICATE OF:										DWB-12-40
<b>PARAMETER</b>										
Benzene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Carbon Tetrachloride	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Chlorobenzene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,2-Dichloroethane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,1,1-Trichloroethane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,1-Dichloroethane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,1,2-Trichloroethane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,1,2,2-Tetrachloroethane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Chloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
2-Chloroethylvinylether	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Chloroform	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,1-Dichloroethene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
trans 1,2-Dichloroethene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,2-Dichloropropane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
trans 1,3-Dichloropropene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Ethylbenzene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Methylene Chloride	44*	45*	45*	43*	43*	43*	44*	44*	20*	17*
Chloromethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromomethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromoform	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Bromodichloromethane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Dibromochloromethane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Tetrachlorothene	17	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0
Toluene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Trichloroethene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Vinyl Chloride	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Trichlorofluoromethane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
cis 1,3-Dichloropropene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Xylenes (total)	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5

All concentrations are in ug/Kg.

TABLE A.5.1. (cont.)  
Volatile Organic Data from Drywell Borings

SAMPLE ID	DWB-13-4	DWB-13-9	DWB-13-14	DWB-13-19	DWB-13-24	DWB-13-29	DWB-13-34	DWB-13-39	DWB-13-44	DWB-13-49	DWB-13-54	DWB-13-64	DWB-13-59
DATE SAMPLED	10-29-87	10-29-87	10-29-87	10-29-87	10-29-87	10-29-87	10-29-87	10-29-87	10-29-87	10-29-87	10-29-87	10-29-87	10-29-87
REPLICATE OF:													DWB-13-54
<b>PARAMETER</b>													
Benzene	5	5	5	5	5	5	5	5	5	5	5	5	5
Carbon Tetrachloride	5	5	5	5	5	5	5	5	5	5	5	5	5
Chlorobenzene	5	5	5	5	5	5	5	5	5	5	5	5	5
1,2-Dichloroethane	5	5	5	5	5	5	5	5	5	5	5	5	5
1,1,1-Trichloroethane	5	5	5	5	5	5	5	5	5	5	5	5	5
1,1-Dichloroethane	5	5	5	5	5	5	5	5	5	5	5	5	5
1,1,2-Trichloroethane	5	5	5	5	5	5	5	5	5	5	5	5	5
1,1,2,2-Tetrachloroethane	5	5	5	5	5	5	5	5	5	5	5	5	5
Chloroethane	5	5	5	5	5	5	5	5	5	5	5	5	5
2-Chloroethylvinylether	5	5	5	5	5	5	5	5	5	5	5	5	5
Chloroform	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
1,1-Dichloroethene	5	5	5	5	5	5	5	5	5	5	5	5	5
trans 1,2-Dichloroethene	5	5	5	5	5	5	5	5	5	5	5	5	5
1,2-Dichloropropane	5	5	5	5	5	5	5	5	5	5	5	5	5
trans 1,3-Dichloropropene	5	5	5	5	5	5	5	5	5	5	5	5	5
Ethylbenzene	5	5	5	5	5	5	5	5	5	5	5	5	5
Methylene Chloride	31*	26*	20*	19*	15*	12*	12*	10	10	10	10	10	10
Chloromethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromomethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromoform	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromodichloromethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Dibromochloromethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Tetrachlorothene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Toluene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Trichloroethene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Vinyl Chloride	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Trichlorofluoromethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
cis 1,3-Dichloropropene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Xylenes (total)	5	5	5	5	5	5	5	5	5	5	5	5	5

All concentrations are in ug/Kg.

TABLE A.5.1. (cont.)  
Volatile Organic Data from Drywell Borings

SAMPLE ID	DWB-15-5	DWB-15-10	DWB-15-15	DWB-15-20	DWB-15-25	DWB-15-30	DWB-15-35	DWB-15-40	DWB-15-45	DWB-15-50	DWB-15-55	DWB-15-65	DWB-15-60
DATE SAMPLED	10-28-87	10-28-87	10-28-87	10-28-87	10-28-87	10-28-87	10-28-87	10-28-87	10-28-87	10-28-87	10-28-87	10-28-87	10-28-87
REPLICATE OF:													DWB-15-55
<b>PARAMETER</b>													
Benzene	5	5	5	5	5	5	5	5	5	5	5	5	5
Carbon Tetrachloride	5	5	5	5	5	5	5	5	5	5	5	5	5
Chlorobenzene	5	5	5	5	5	5	5	5	5	5	5	5	5
1,2-Dichloroethane	5	5	5	5	5	5	5	5	5	5	5	5	5
1,1,1-Trichloroethane	21	5	5	5	5	5	5	5	5	5	5	5	5
1,1-Dichloroethane	5	5	5	5	5	5	5	5	5	5	5	5	5
1,1,2-Trichloroethane	5	5	5	5	5	5	5	5	5	5	5	5	5
1,1,2,2-Tetrachloroethane	5	5	5	5	5	5	5	5	5	5	5	5	5
Chloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
2-Chloroethylvinylether	5	5	5	5	5	5	5	5	5	5	5	5	5
Chloroform	5	5	5	5	5	5	5	5	5	5	5	5	5
1,1-Dichloroethene	5	5	5	5	5	5	5	5	5	5	5	5	5
trans 1,2-Dichloroethene	5	5	5	5	5	5	5	5	5	5	5	5	5
1,2-Dichloropropane	5	5	5	5	5	5	5	5	5	5	5	5	5
trans 1,3-Dichloropropene	5	5	5	5	5	5	5	5	5	5	5	5	5
Ethylbenzene	5	5	5	5	5	5	5	5	5	5	5	5	5
Methylene Chloride	16*	16*	17*	19*	19*	140*	73*	250*	34*	47*	115*	<10	<10
Chloromethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromomethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromoform	5	5	5	5	5	5	5	5	5	5	5	5	5
Bromodichloromethane	5	5	5	5	5	5	5	5	5	5	5	5	5
Dibromochloromethane	5	5	5	5	5	5	5	5	5	5	5	5	5
Tetrachlorothene	5	5	5	5	5	5	5	5	5	5	5	5	5
Toluene	5	5	5	5	5	5	5	5	5	5	5	5	5
Trichloroethene	5	5	5	5	5	5	5	5	5	5	5	5	5
Vinyl Chloride	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Trichlorofluoromethane	5	5	5	5	5	5	5	5	5	5	5	5	5
cis 1,3-Dichloropropene	5	5	5	5	5	5	5	5	5	5	5	5	5
Xylenes (total)	5	5	5	5	5	5	5	5	5	5	5	5	5

All concentrations are in ug/Kg.

**TABLE A.5.1. (cont.)**  
Volatile Organic Data from Drywell Borings

SAMPLE ID	DWB-16-5	DWB-16-10	DWB-16-15	DWB-16-20	DWB-16-25	DWB-16-30	DWB-16-35	DWB-16-40	DWB-16-45	DWB-16-50	DWB-16-55	DWB-16-60
DATE SAMPLED	10-21-87	10-21-87	10-21-87	10-21-87	10-21-87	10-21-87	10-21-87	10-21-87	10-21-87	10-21-87	10-21-87	10-21-87
REPLICATE OF:												
<b>PARAMETER</b>												
Benzene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Carbon Tetrachloride	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Chlorobenzene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,2-Dichloroethane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,1,1-Trichloroethane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,1-Dichloroethane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,1,2-Trichloroethane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,1,2,2-Tetrachloroethane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Chloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
2-Chloroethylvinylether	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Chloroform	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,1-Dichloroethene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
trans 1,2-Dichloroethene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,2-Dichloropropane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
trans 1,3-Dichloropropene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Ethylbenzene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Methylene Chloride	19*	18*	16*	<10	19*	17*	34*	31*	30*	29*	10	48*
Chloromethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromomethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromoform	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Bromodichloromethane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Dibromochloromethane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Tetrachloroethene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Toluene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Trichloroethene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Vinyl Chloride	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Trichlorofluoromethane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
cis 1,3-Dichloropropene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Xylenes (total)	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5

All concentrations are in ug/Kg. \* Probable laboratory contamination \*\* Compound also found in the laboratory blank.

TABLE A.5.1. (cont.)

Volatile Organic Data from Drywell Borings

SAMPLE ID	DWB-16-65	DWB-16-75	DWB-16-70
DATE SAMPLED	10-21-87	10-21-87	10-21-87
REPLICATE OF:		DWB-16-65	
<hr/>			
PARAMETER			
Benzene	<5	<5	<5
Carbon Tetrachloride	<5	<5	<5
Chlorobenzene	<5	<5	<5
1,2-Dichloroethane	<5	<5	<5
1,1,1-Trichloroethane	<5	<5	<5
1,1-Dichloroethane	<5	<5	<5
1,1,2-Trichloroethane	<5	<5	<5
1,1,2,2-Tetrachloroethane	<5	<5	<10
Chloroethane	<10	<10	<5
2-Chloroethylvinylether	<5	<5	<5
Chloroform	<5	<5	<5
1,1-Dichloroethene	<5	<5	<5
trans 1,2-Dichloroethene	<5	<5	<5
1,2-Dichloropropane	<5	<5	<5
trans 1,3-Dichloropropene	<5	<5	<5
Ethylbenzene	<5	<5	<5
Methylene Chloride	48*	46*	52*
Chloromethane	<10	<10	<10
Bromomethane	<10	<10	<10
Bromoform	<5	<5	<5
Bromodichloromethane	<5	<5	<5
Dibromochloromethane	<5	<5	<5
Tetrachloroethene	<5	<5	<5
Toluene	<5	<5	<5
Trichloroethene	<5	<5	<5
Vinyl Chloride	<10	<10	<10
Trichlorofluoromethane	<5	<5	<5
cis 1,3-Dichloropropene	<5	<5	<5
Xylenes (total)	<5	<5	<5

TABLE A.5.2.  
Inorganic Data from Drywell Borings

SAMPLE ID	REP. OF	SAMPLED	Ag	As	Ba	Cd	Cn	Cr	Cr 6	Cu	Hg	Ni	Pb	Se	Zn	pH	% TS
DWB-4-5	DWB-4-45	10-15-87	<1	<10	<50	<1	<10	26	<0.5	8	<0.5	11	8	<0.5	14	4.9	81.2
DWB-4-10		10-15-87	<1	<10	120	<1	<10	17	<0.5	6	<0.5	<5	7	<0.5	4	5.0	73.2
DWB-4-15		10-15-87	<1	<10	<50	<1	<10	24	<0.5	10	<0.5	<5	4	<0.5	13	3.4	81.9
DWB-4-20		10-15-87	<1	<10	<50	<1	<10	34	<0.5	2	<0.5	<5	7	<0.5	4	4.0	87.1
DWB-4-25		10-15-87	<1	<10	<50	<1	<10	45	<0.5	2	<0.5	<5	6	<0.5	5	4.0	85.8
DWB-4-30		10-15-87	<1	<10	<50	<1	<10	23	<0.5	3	<0.5	6	6	<0.5	12	6.7	86.0
DWB-4-35		10-15-87	<1	<10	<50	<1	<10	24	<0.5	2	<0.5	9	4	<0.5	38	7.8	84.0
DWB-4-40		10-15-87	<1	<10	<50	<1	<10	24	<0.5	1	<0.5	<5	1	<0.5	9	8.0	87.1
DWB-4-45		10-15-87	<1	<10	<50	<1	<10	52	<0.5	1	<0.5	<5	1	<0.5	12	4.5	87.3
DWB-4-60		10-15-87	<1	<10	<50	<1	<10	57	<0.5	1	<0.5	<5	2	<0.5	11	4.4	87.2
DWB-4-50	DWB-5-50	10-15-87	<1	<10	<50	<1	<10	48	<0.5	2	<0.5	<5	<1	<0.5	14	4.2	88.5
DWB-4-55		10-15-87	<1	<10	<50	<1	<10	40	<0.5	1	<0.5	<5	<1	<0.5	15	4.5	88.9
DWB-5-5		10-16-87	<1	<10	<50	<1	<10	37	<0.5	3	<0.5	8	2	<0.5	10	5.6	85.2
DWB-5-10		10-16-87	<1	<10	150	<1	<10	16	<0.5	4	<0.5	<5	6	<0.5	1	4.1	75.6
DWB-5-15		10-16-87	<1	<10	<50	<1	<10	32	<0.5	2	<0.5	<5	<1	<0.5	3	4.5	83.8
DWB-5-20		10-16-87	<1	<10	<50	<1	<10	32	<0.5	2	<0.5	<5	2	<0.5	3	4.5	86.8
DWB-5-25		10-16-87	<1	<10	70	<1	<10	32	<0.5	2	<0.5	7	5	<0.5	6	5.3	86.5
DWB-5-30		10-16-87	<1	<10	80	<1	<10	25	<0.5	2	<0.5	10	5	<0.5	16	8.0	86.4
DWB-5-35		10-16-87	<1	<10	<50	<1	<10	25	<0.5	3	<0.5	7	<1	<0.5	20	8.2	81.8
DWB-5-40		10-16-87	<1	<10	<50	<1	<10	44	<0.5	1	<0.5	8	1	<0.5	11	5.1	87.8
DWB-5-45	DWB-7-40	10-16-87	<1	<10	<50	<1	<10	54	<0.5	2	<0.5	2	1	<0.5	11	7.0	86.8
DWB-5-50		10-16-87	<1	<10	<50	<1	<10	67	<0.5	1	<0.5	4	<1	<0.5	16	5.1	89.4
DWB-5-60		10-16-87	<1	<10	<50	<1	<10	64	<0.5	2	<0.5	12	1	<0.5	14	5.1	90.3
DWB-5-55		10-16-87	<1	<10	<50	<1	<10	47	<0.5	2	<0.5	8	<1	<0.5	16	4.7	90.4
DWB-7-5		10-29-87	<1	<10	135	1	<1	29	<0.5	6	<0.5	<5	1	<0.5	11	5.4	87.7
DWB-7-10		10-29-87	<1	<10	110	<1	<1	69	<0.5	4	<0.5	<5	<1	<0.5	7	5.7	87.1
DWB-7-15		10-29-87	<1	<10	101	1	<1	65	<0.5	3	<0.5	<5	3	<0.5	6	5.2	86.0
DWB-7-20		10-29-87	<1	<10	126	1	<1	73	<0.5	2	<0.5	<5	2	<0.5	6	4.9	85.3
DWB-7-25		10-29-87	<1	<10	115	<1	<1	119	<0.5	4	<0.5	<5	<1	<0.5	15	5.2	85.7
DWB-7-30		10-29-87	<1	<10	108	<1	<1	60	<0.5	2	<0.5	<5	<1	<0.5	24	5.9	85.0
DWB-7-35		10-29-87	<1	<10	109	1	<1	71	<0.5	2	<0.5	<5	<1	<0.5	24	5.2	85.5
DWB-7-40		10-29-87	<1	<10	126	<1	<1	94	<0.5	2	<0.5	<5	<1	<0.5	15	5.6	89.1
DWB-7-55		10-29-87	<1	<10	127	1	<1	88	<0.5	2	<0.5	<5	<1	<0.5	12	5.8	89.8
DWB-7-45		10-29-87	<1	<10	99	1	<1	90	<0.5	2	<0.5	<5	<1	<0.5	11	5.9	90.2
DWB-7-50		10-29-87	<1	<10	102	1	<1	94	<0.5	1	<0.5	<5	<1	<0.5	11	5.9	89.3

Metal concentrations are in mg/Kg.

TABLE A.5.2. (cont.)  
Inorganic Data from Drywell Borings

SAMPLE ID	REP. OF	SAMPLED	Ag	As	Ba	Cd	Cn	Cr	Cr 6	Cu	Hg	Ni	Pb	Se	Zn	pH	% TS	
DWB-8-3		10-23-87	<1	<10	<50	<1	<10	28	<0.5	8	<0.5	<5	6	<0.5	9	4.8	80.6	
DWB-8-8		10-23-87	<1	<10	420	<1	<10	55	<0.5	6	<0.5	<5	9	<0.5	3	6.5	78.9	
DWB-8-13		10-23-87	2	<10	376	<1	<1	40	<0.5	7	<0.5	<5	9	<0.5	13	7.4	81.6	
DWB-8-18		10-23-87	<1	<10	<50	<1	<1	49	<0.5	3	<0.5	<5	30	<0.5	6	7.6	83.2	
DWB-8-23		10-23-87	<1	<10	99	<1	<1	43	<0.5	4	<0.5	<5	6	<0.5	9	6.8	81.7	
DWB-8-28		10-23-87	<1	<10	<50	<1	<1	68	<0.5	3	<0.5	<5	1	<0.5	17	7.3	80.4	
DWB-8-33		10-23-87	<1	<10	<50	<1	<1	58	<0.5	1	<0.5	<5	3	<0.5	11	8.2	83.6	
DWB-8-38		10-23-87	<1	<10	<50	<1	<1	66	<0.5	1	<0.5	<5	1	<0.5	15	8.0	85.5	
DWB-8-43		10-23-87	<1	<10	<50	<1	<1	142	<0.5	2	<0.5	<5	13	<0.5	16	7.5	81.2	
DWB-8-48	DWB-8-43	10-23-87	<1	<10	<50	<1	<1	105	<0.5	1	<0.5	<5	17	<0.5	14	7.7	83.6	
DWB-8-48		10-26-87	<1	<10	72	<1	<1	83	<0.5	1	<0.5	<5	5	<0.5	13	7.9	85.6	
DWB-8-53		10-26-87	<1	<10	<50	<1	<1	123	<0.5	2	<0.5	<5	2	<0.5	24	8.0	87.4	
DWB-9D-4		11-02-87	<1	<10	<50	<1	<1	13	<0.5	4	<0.5	12	8	<0.5	16	6.1	86.1	
DWB-9D-9		11-02-87	<1	<10	70	<1	<1	17	<0.5	7	<0.5	6	5	<0.5	15	5.2	81.3	
DWB-9D-14		11-02-87	<1	<10	293	<1	<1	65	<0.5	3	<0.5	<5	124	<0.5	5	8.0	84.1	
DWB-9D-19		11-02-87	<1	<10	220	<1	<1	69	<0.5	3	<0.5	<5	18	<0.5	5	7.0	83.5	
DWB-9D-24		11-03-87	<1	<10	<50	<1	<1	64	<0.5	3	<0.5	<5	<1	<0.5	11	7.9	84.1	
DWB-9D-29		11-03-87	<1	<10	51	<1	<1	57	1.0	2	<0.5	<5	<1	<0.5	8	7.5	87.6	
DWB-9D-1	DWB-9D-29	11-03-87	<1	<10	50	<1	<1	84	0.7	3	<0.5	8	1	<0.5	16	7.2	88.2	
DWB-9D-34		11-03-87	<1	<10	<50	<1	<1	59	<0.5	1	<0.5	<5	<1	<0.5	9	7.6	87.2	
DWB-9D-39		11-03-87	<1	<10	<50	<1	<1	118	2.0	2	<0.5	<5	6	<0.5	18	7.2	90.1	
DWB-9D-44		11-03-87	<1	<10	<50	<1	<1	168	1.2	2	<0.5	<5	3	<0.5	17	5.8	89.5	
DWB-9D-49		11-03-87	<1	<10	<50	<1	<1	148	2.3	2	<0.5	<5	<1	<0.5	16	5.2	89.9	
DWB-9D-54		11-03-87	<1	<10	<50	<1	<1	144	1.4	2	<0.5	<5	6	<0.5	19	5.3	88.2	
DWB-9D-59		11-03-87	<1	<10	<50	<1	<1	95	0.7	2	<0.5	<5	8	<0.5	17	5.3	89.2	
DWB-9D-64		11-03-87	<1	<10	<50	<1	<1	114	0.7	3	<0.5	<5	5	<0.5	36	5.4	84.9	
DWB-9D-69		11-03-87	<1	<10	<50	<1	<1	73	<0.5	2	<0.5	<5	1	<0.5	28	4.8	83.7	
DWB-9D-74	DWB-9D-74	11-03-87	<1	<10	<50	<1	<1	71	<0.5	2	<0.5	<5	5	12	<0.5	35	4.8	83.0
DWB-9D-99		11-03-87	<1	<10	<50	<1	<1	57	<0.5	2	<0.5	<5	6	<0.5	27	4.8	84.2	
DWB-9D-79		11-03-87	<1	<10	<50	<1	<1	67	<0.5	2	<0.5	<5	8	<0.5	27	5.5	85.8	
DWB-9D-84		11-03-87	<1	<10	51	<1	<1	50	<0.5	2	<0.5	<5	4	<0.5	22	5.6	90.4	
DWB-9D-89		11-03-87	<1	<10	<50	<1	<1	53	<0.5	2	<0.5	<5	6	<0.5	31	5.8	87.0	
DWB-9D-94		11-03-87	<1	<10	<50	<1	<1	48	<0.5	2	<0.5	<5	5	<0.5	31	5.3	71.9	

Metal concentrations are in mg/Kg.

TABLE A.5.2. (cont.)  
Inorganic Data from Drywell Borings

SAMPLE ID	REP. OF	SAMPLED	Ag	As	Ba	Cd	Cn	Cr	Cr 6	Cu	Hg	Ni	Pb	Se	Zn	pH	% TS
DWB-9U-5		10-30-87	<1	<10	<50	<1	<1	92	<0.5	11	<0.5	<5	11	<0.5	38	5.6	75.3
DWB-9U-10		10-30-87	<1	<10	<50	<1	<1	36	<0.5	3	<0.5	<5	2	<0.5	6	6.4	90.8
DWB-9U-15		10-30-87	<1	<10	<50	<1	<1	62	<0.5	2	<0.5	<5	12	<0.5	7	6.4	84.4
DWB-9U-20		10-30-87	<1	<10	<50	<1	<1	50	<0.5	3	<0.5	<5	5	<0.5	6	6.3	84.6
DWB-9U-25		10-30-87	<1	<10	<50	<1	<1	77	<0.5	3	<0.5	<5	1	<0.5	10	6.1	83.3
DWB-9U-30		10-30-87	<1	<10	<50	<1	<1	61	<0.5	2	<0.5	<7	1	<0.5	10	7.4	85.7
DWB-9U-35		10-30-87	<1	<10	<50	<1	<1	60	<0.5	2	<0.5	<5	14	<0.5	15	7.9	85.6
DWB-9U-40		10-30-87	<1	<10	<50	<1	<1	127	<0.5	2	<0.5	<5	4	<0.5	10	6.3	87.1
DWB-9U-45		10-30-87	<1	<10	<50	<1	<1	88	1.6	2	<0.5	6	3	<0.5	13	5.9	88.6
DWB-9U-0	DWB-9U-45	10-30-87	<1	<10	<50	<1	<1	106	1.3	2	<0.5	5	4	<0.5	14	5.8	88.3
DWB-9U-50		10-30-87	<1	<10	<50	<1	<1	109	0.6	2	<0.5	<5	5	<0.5	13	6.0	87.8
DWB-9U-55		10-30-87	<1	<10	<50	<1	<1	94	0.5	2	<0.5	<5	5	<0.5	20	5.6	81.7
DWB-9U-60		10-30-87	<1	<10	<50	<1	<1	61	<0.5	2	<0.5	<7	5	<0.5	25	5.6	86.6
DWB-9U-65		10-30-87	<1	<10	<50	<1	<1	47	<0.5	2	<0.5	5	2	<0.5	28	5.3	84.8
DWB-9U-70		11-02-87	<1	<10	<50	<1	<1	46	<0.5	2	<0.5	9	1	<0.5	20	5.7	83.4
DWB-9U-75		11-02-87	<1	<10	<50	<1	<1	35	<0.5	2	<0.5	10	6	<0.5	21	5.5	85.2
DWB-9U-80		11-02-87	<1	<10	<50	<1	<1	48	<0.5	2	<0.5	7	9	<0.5	18	5.8	90.2
DWB-9U-85		11-02-87	<1	<10	<50	<1	<1	59	<0.5	2	<0.5	8	5	<0.5	32	5.7	86.8
DWB-9U-90	DWB-9U-90	11-02-87	<1	<10	<50	<1	<1	29	<0.5	2	<0.5	7	3	<0.5	29	5.9	85.8
DWB-9U-100		11-02-87	<1	<10	<50	<1	<1	28	<0.5	2	<0.5	8	3	<0.5	32	5.9	81.0
DWB-10-4		10-16-87	<1	<10	<50	<1	<10	24	<0.5	4	<0.5	16	4	<0.5	10	4.8	73.9
DWB-10-9		10-16-87	<1	<10	<50	2	<10	11	<0.5	5	<0.5	<5	2	<0.5	3	4.9	76.0
DWB-10-14		10-16-87	<1	<10	<50	1	<10	27	<0.5	2	<0.5	<5	2	<0.5	4	4.5	83.9
DWB-10-19		10-16-87	<1	<10	<50	1	<10	33	<0.5	1	<0.5	<5	3	<0.5	3	4.4	85.9
DWB-10-24		10-16-87	<1	<10	<50	2	<10	39	<0.5	2	<0.5	<5	5	<0.5	6	4.6	86.6
DWB-10-29		10-16-87	<1	<10	<50	<1	<10	27	<0.5	2	<0.5	<5	2	<0.5	12	5.1	83.9
DWB-10-34		10-16-87	<1	<10	<50	<1	<10	32	<0.5	2	<0.5	<5	<1	<0.5	60	7.0	79.3
DWB-10-39		10-19-87	<1	<10	<50	1	<10	47	<0.5	1	<0.5	<5	<1	<0.5	20	7.2	88.2
DWB-10-44		10-19-87	<1	<10	<50	2	<10	101	<0.5	2	<0.5	<5	2	<0.5	28	8.0	84.8
DWB-10-49	DWB-10-44	10-19-87	<1	<10	<50	<1	<10	86	<0.5	2	<0.5	<5	1	<0.5	20	7.5	84.1
DWB-10-54		10-19-87	<1	<10	<50	2	<10	45	<0.5	<1	<0.5	<5	<1	<0.5	14	4.4	89.8
		10-19-87	<1	<10	<50	2	<10	65	<0.5	1	<0.5	<5	<1	<0.5	19	4.8	88.1

Metal concentrations are in mg/Kg.

TABLE A.5.2. (cont.)  
Inorganic Data from Drywell Borings

SAMPLE ID	REP. OF	SAMPLED	Ag	As	Ba	Cd	Cn	Cr	Cr 6	Cu	Hg	Ni	Pb	Se	Zn	pH	% TS
DWB-11-5		10-22-87	<1	<10	<50	<1	<10	25	<0.5	4	<0.5	<5	3	<0.5	10	4.7	78.2
DWB-11-10		10-22-87	<1	<10	<50	<1	<10	11	<0.5	4	<0.5	5	<0.5	4	6.0	73.2	
DWB-11-15		10-22-87	<1	<10	200	<1	<10	33	<0.5	1	<0.5	4	<0.5	5	5.3	85.3	
DWB-11-20		10-22-87	<1	<10	<50	<1	<10	43	<0.5	1	<0.5	4	<1	<0.5	8	4.8	82.7
DWB-11-25		10-22-87	<1	<10	<50	<1	<10	66	<0.5	1	<0.5	4	<1	<0.5	8	5.8	85.7
DWB-11-30		10-22-87	<1	<10	<50	<1	<10	49	<0.5	1	<0.5	3	<0.5	8	6.9	86.1	
DWB-11-35		10-22-87	<1	<10	<50	<1	<10	47	<0.5	5	<0.5	3	<0.5	31	7.5	78.2	
DWB-11-40		10-22-87	<1	<10	<50	<1	<10	39	<0.5	1	<0.5	1	<0.5	19	7.9	86.3	
DWB-11-60	DWB-11-40	10-22-87	<1	<10	<50	<1	<10	35	<0.5	2	<0.5	3	<0.5	12	7.8	83.4	
DWB-11-45		10-22-87	<1	<10	<50	<1	<10	84	<0.5	1	<0.5	3	<0.5	15	7.6	87.2	
DWB-11-50		10-22-87	<1	<10	<50	<1	<10	42	<0.5	1	<0.5	3	<0.5	15	7.9	91.6	
DWB-11-55		10-22-87	<1	<10	<50	<1	<10	55	<0.5	1	<0.5	4	<0.5	14	4.8	90.0	
DWB-12-5		10-27-87	<1	<10	106	<1	<1	37	<0.5	6	<0.5	8	7	<0.5	21	5.2	85.8
DWB-12-10		10-27-87	<1	<10	88	<1	<1	36	<0.5	5	<0.5	6	<0.5	7	5.6	82.1	
DWB-12-15		10-27-87	<1	<10	<50	<1	<1	44	<0.5	2	<0.5	5	<0.5	7	5.1	88.9	
DWB-12-20		10-27-87	<1	<10	<50	<1	<1	81	<0.5	2	<0.5	6	9	<0.5	11	4.9	87.7
DWB-12-25		10-27-87	<1	<10	<50	<1	<1	83	<0.5	2	<0.5	7	11	<0.5	14	5.2	87.0
DWB-12-30		10-27-87	<1	<10	<50	<1	<1	63	<0.5	2	<0.5	8	12	<0.5	40	5.5	83.7
DWB-12-35		10-27-87	<1	<10	<50	<1	<1	68	<0.5	2	<0.5	8	2	<0.5	22	5.8	88.2
DWB-12-40		10-27-87	<1	<10	<50	<1	<1	76	<0.5	4	<0.5	6	5	<0.5	47	6.6	82.9
DWB-12-50	DWB-12-40	10-27-87	1	<10	53	<1	<1	81	<0.5	4	<0.5	5	<0.5	36	6.8	82.1	
DWB-12-45		10-27-87	<1	<10	<50	<1	<1	97	<0.5	1	<0.5	3	<0.5	18	5.3	91.9	
DWB-13-4		10-29-87	<1	<10	130	1	<1	24	<0.5	4	<0.5	4	<1	<0.5	3	5.5	85.1
DWB-13-9		10-29-87	<1	<10	124	<1	<1	34	<0.5	3	<0.5	4	<1	<0.5	2	6.0	86.4
DWB-13-14		10-29-87	<1	<10	155	<1	<1	67	<0.5	3	<0.5	4	<1	<0.5	5	5.4	82.7
DWB-13-19		10-29-87	<1	<10	257	<1	<1	72	<0.5	3	<0.5	4	<1	<0.5	4	5.8	85.1
DWB-13-24		10-29-87	<1	<10	133	1	<1	101	<0.5	4	<0.5	1	<0.5	15	6.4	84.8	
DWB-13-29		10-29-87	<1	<10	<50	<1	<1	54	<0.5	2	<0.5	1	<0.5	14	6.7	88.0	
DWB-13-34		10-29-87	<1	<10	<50	<1	<1	50	<0.5	2	<0.5	1	<0.5	20	6.9	88.9	
DWB-13-39		10-29-87	<1	<10	<50	<1	<1	77	<0.5	2	<0.5	3	<0.5	13	7.5	89.1	
DWB-13-44		10-29-87	<1	<10	<50	<1	<1	73	<0.5	2	<0.5	1	<0.5	10	8.1	94.9	
DWB-13-49		10-29-87	<1	<10	<50	<1	<1	79	<0.5	1	<0.5	3	<0.5	11	7.8	89.1	
DWB-13-54		10-29-87	<1	<10	<50	<1	<1	96	<0.5	2	<0.5	4	<0.5	15	5.7	87.5	
DWB-13-64	DWB-13-54	10-29-87	<1	<10	<50	<1	<1	93	<0.5	2	<0.5	7	<0.5	14	5.7	86.3	
DWB-13-59		10-29-87	<1	<10	<50	<1	<1	83	<0.5	3	<0.5	4	<0.5	24	7.1	86.6	

Metal concentrations are in mg/Kg.

TABLE A.5.2. (cont.)  
Inorganic Data from Drywell Borings

SAMPLE ID	REP. OF	SAMPLED	Ag	As	Ba	Cd	Cn	Cr	Cr 6	Cu	Hg	Ni	Pb	Se	Zn	pH	% TS
DWB-15-5		10-28-87	<1	<10	121	<1	<1	41	<0.5	7	<0.5	<5	7	<0.5	7	5.3	81.7
DWB-15-10		10-28-87	<1	<10	82	<1	<1	42	<0.5	4	<0.5	<5	3	<0.5	5	5.8	84.8
DWB-15-15		10-28-87	<1	<10	<50	<1	<1	86	<0.5	6	<0.5	<5	7	<0.5	22	5.8	86.2
DWB-15-20		10-28-87	<1	<10	103	<1	<1	73	<0.5	3	<0.5	<5	2	<0.5	10	6.5	87.1
DWB-15-25		10-28-87	<1	<10	60	<1	<1	80	<0.5	3	<0.5	<5	<1	<0.5	8	6.4	84.7
DWB-15-30		10-28-87	<1	<10	71	1	<1	89	<0.5	3	<0.5	<5	<1	<0.5	27	6.2	84.9
DWB-15-35		10-28-87	<1	<10	72	<1	<1	112	<0.5	2	<0.5	<5	<1	<0.5	23	6.1	86.7
DWB-15-40		10-28-87	2	<10	<50	<1	<1	87	<0.5	3	<0.5	<5	2	<0.5	18	5.6	88.3
DWB-15-45		10-28-87	<1	<10	<50	<1	<1	100	<0.5	2	<0.5	<5	<1	<0.5	16	6.0	87.6
DWB-15-50		10-28-87	<1	<10	87	1	<1	120	<0.5	2	<0.5	<5	<1	<0.5	17	5.4	84.9
DWB-15-55		10-28-87	<1	<10	105	<1	<1	85	<0.5	2	<0.5	<5	<1	<0.5	13	5.7	87.2
DWB-15-65	DWB-15-55	10-28-87	<1	<10	87	<1	<1	81	<0.5	2	<0.5	<5	<1	<0.5	16	5.8	86.7
DWB-15-60		10-28-87	<1	<10	102	<1	<1	74	<0.5	2	<0.5	<5	<2	<0.5	18	5.9	86.4
DWB-16-5		10-21-87	<1	<10	<50	<1	<10	24	<0.5	5	<0.5	<5	12	<0.5	13	4.7	83.4
DWB-16-10		10-21-87	<1	<10	150	1	<10	13	<0.5	4	<0.5	<5	10	<0.5	16	4.6	74.6
DWB-16-15		10-21-87	<1	<10	<50	<1	<10	37	<0.5	<1	<0.5	<5	4	<0.5	5	4.5	84.6
DWB-16-20		10-21-87	<1	<10	<50	<1	<10	29	<0.5	<1	<0.5	<5	9	<0.5	10	4.4	86.5
DWB-16-25		10-21-87	<1	<10	<50	<1	<10	33	<0.5	<1	<0.5	<5	4	<0.5	7	4.5	87.0
DWB-16-30		10-21-87	<1	<10	<50	<1	<10	33	<0.5	1	<0.5	<5	3	<0.5	13	5.0	82.6
DWB-16-35		10-21-87	<1	<10	<50	<1	<10	42	<0.5	1	<0.5	<5	<1	<0.5	43	6.8	79.7
DWB-16-40		10-21-87	<1	<10	<50	<1	<10	56	<0.5	<1	<0.5	<5	<1	<0.5	20	6.2	86.4
DWB-16-45		10-21-87	<1	<10	<50	<1	<10	92	<0.5	<1	<0.5	<5	4	<0.5	20	8.0	81.2
DWB-16-50		10-21-87	<1	<10	<50	<1	<10	51	<0.5	<1	<0.5	<5	<1	<0.5	15	8.1	84.9
DWB-16-55		10-21-87	<1	<10	<50	<1	<10	68	<0.5	<1	<0.5	<5	<1	<0.5	36	8.2	85.9
DWB-16-60		10-22-87	<1	<10	<50	<1	<10	51	<0.5	1	<0.5	<5	<1	<0.5	22	6.2	84.1
DWB-16-75	DWB-16-60	10-22-87	<1	<10	<50	<1	<10	60	<0.5	<1	<0.5	<5	<1	<0.5	27	6.3	84.5
DWB-16-65		10-22-87	<1	<10	<50	<1	<10	78	<0.5	<1	<0.5	<5	<1	<0.5	36	4.9	84.2
DWB-16-70		10-22-87	<1	<10	<50	<1	<10	64	<0.5	1	<0.5	<5	<1	<0.5	27	4.5	77.5

Metal concentrations are in mg/Kg.

**TABLE A.5.3.**  
Volatile Organic Data from Septic Tank Borings

SAMPLE ID	STB-11-5	STB-11-10	STB-11-15	STB-11-25	STB-11-20	STB-10-4	STB-10-9	STB-10-14	STB-10-19	STB-10-24
DATE SAMPLED	10-19-87	10-19-87	10-19-87	10-19-87	10-19-87	10-19-87	10-19-87	10-19-87	10-19-87	10-19-87
REPLICATE OF:				STB-11-15						STB-10-19
<b>PARAMETER</b>										
Benzene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Carbon Tetrachloride	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Chlorobenzene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,2-Dichloroethane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,1,1-Trichloroethane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,1-Dichloroethane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,1,2-Trichloroethane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,1,2,2-Tetrachloroethane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Chloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
2-Chloroethylvinylether	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Chloroform	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,1-Dichloroethene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
trans 1,2-Dichloroethane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,2-Dichloropropane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
trans 1,3-Dichloropropene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Ethylbenzene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Methylene Chloride	25*	18*	19*	11*	15*	17*	17*	14*	16*	10*
Chloromethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromomethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromoform	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Bromodichloromethane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Dibromochloromethane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Tetrachloroethene	7.5	15	10	18	14	11	18	7.4	<5	<5
Toluene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Trichloroethene	5.2	<5	<5	<5	<5	<5	<5	<5	<10	<10
Vinyl Chloride	<10	<10	<10	<10	<10	<10	<10	<10	<5	<5
Trichlorofluoromethane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
cis 1,3-Dichloropropene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Total Xylenes	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5

All concentrations are in ug/Kg. \* Probable laboratory contamination \*\* Compound also found in laboratory blank

TABLE A.5.3. (cont.)

Volatile Organic Data from Septic Tank Borings

SAMPLE ID	STB-3I-4 10-14-87	STB-3I-9 10-14-87	STB-3I-14 10-14-87	STB-3I-214 10-14-87	STB-3I-19 10-14-87		STB-30-3 10-15-87	STB-30-8 10-15-87	STB-30-13 10-15-87	STB-30-18 10-15-87	STB-30-19 10-15-87	
REPLICATE OF:	STB-3I-14						STB-30-3 STB-30-18	STB-30-8 STB-30-18	STB-30-13 STB-30-18	STB-30-18 STB-30-19	STB-30-19 STB-30-18	
<b>PARAMETER</b>												
Benzene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Carbon Tetrachloride	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Chlorobenzene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,2-Dichloroethane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,1,1-Trichloroethane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	83**
1,1-Dichloroethane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,1,2-Trichloroethane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<10
1,1,2,2-Tetrachloroethane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Chloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
2-Chloroethylvinylether	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Chloroform	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,1-Dichloroethene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
trans 1,2-Dichloroethane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,2-Dichloropropane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
trans 1,3-Dichloropropene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Ethylbenzene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Methylene Chloride	99*	6*	6*	6*	7*	7*	100*	109*	56*	9*	9*	10*
Chloromethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromomethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromoform	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Bromodichloromethane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Dibromochloromethane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Tetrachloroethene	<5	<5	8**	<5	<5	<5	<5	<5	<5	<5	<5	59**
Toluene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Trichloroethene	14**	11**	17**	9**	7**	7**	14**	12**	15**	18**	18**	172**
Vinyl Chloride	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Trichlorofluoromethane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
cis 1,3-Dichloropropene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Total Xylenes	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5

All concentrations are in ug/Kg. \* Probable laboratory contamination \*\* Compound also found in laboratory blank

**TABLE A.5.3. (cont.)**  
Volatile Organic Data from Septic Tank Borings

SAMPLE ID	STB-61-5 10-26-87	STB-61-10 10-26-87	STB-61-15 10-26-87	STB-61-25 10-26-87	STB-61-20 10-26-87	STB-61-15	STB-60-4 10-26-87	STB-60-9 10-26-87	STB-60-24 10-26-87	STB-60-14 10-26-87	STB-60-19 10-26-87
<hr/>											
<hr/>											
PARAMETER											
Benzene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Carbon Tetrachloride	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Chlorobenzene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,2-Dichloroethane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,1,1-Trichloroethane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,1-Dichloroethane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,1,2-Trichloroethane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,1,2,2-Tetrachloroethane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Chloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
2-Chloroethylvinylether	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Chloroform	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,1-Dichloroethene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
trans 1,2-Dichloroethane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,2-Dichloropropane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
trans 1,3-Dichloropropene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Ethylbenzene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Methylene Chloride	61*	68*	14*	50*	48*		52*	17*		107*	46*
Chloromethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromomethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromoform	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Bromodichloromethane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Dibromochloromethane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Tetrachloroethene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Toluene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Trichloroethene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Vinyl Chloride	<10	<10	8.0	<10	<10	<10	<10	<10	<10	<10	<10
Trichlorofluoromethane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
cis 1,3-Dichloropropene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Total Xylenes	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5

All concentrations are in ug/Kg. \* Probable laboratory contamination \*\* Compound also found in laboratory blank

**TABLE A.5.3. (cont.)**  
**Volatile Organic Data from Septic Tank Borings**

SAMPLE ID	STB-14I-5	STB-14I-10	STB-14I-15	STB-14I-215	STB-14I-20
DATE SAMPLED	10-14-87	10-14-87	10-14-87	10-14-87	10-14-87
REPLICATE OF:				STB-14I-15	
<hr/>					
PARAMETER					
Benzene	<5	<5	<5	<5	<5
Carbon Tetrachloride	<5	<5	<5	<5	<5
Chlorobenzene	<5	<5	<5	<5	<5
1,2-Dichloroethane	<5	<5	<5	<5	<5
1,1,1-Trichloroethane	<5	<5	<5	<5	<5
1,1-Dichloroethane	<5	<5	<5	<5	<5
1,1,2-Trichloroethane	<5	<5	<5	<5	<5
1,1,2-Tetrachloroethane	<5	<5	<5	<5	<5
Chloroethane	<10	<10	<10	<10	<10
2-Chloroethylvinylether	<5	<5	<5	<5	<5
Chloroform	<5	<5	<5	<5	<5
1,1-Dichloroethene	<5	<5	<5	<5	<5
trans 1,2-Dichloroethane	<5	<5	<5	<5	<5
1,2-Dichloropropane	<5	<5	<5	<5	<5
trans 1,3-Dichloropropene	<5	<5	<5	<5	<5
Ethylbenzene	<5	<5	<5	<5	<5
Methylene Chloride	9*	10*	110*	230*	197*
Chloromethane	<10	<10	<10	<10	<10
Bromomethane	<10	<10	<10	<10	<10
Bromoform	<5	<5	<5	<5	<5
Bromodichloromethane	<5	<5	<5	<5	<5
Dibromochloromethane	<5	<5	<5	<5	<5
Tetrachloroethene	<5	7**	<5	<5	<5
Toluene	<5	<5	<5	<5	<5
Trichloroethene	13**	14**	5**	6**	7**
Vinyl Chloride	<10	<10	<10	<10	<10
Trichlorofluoromethane	<5	<5	<5	<5	<5
cis 1,3-Dichloropropene	<5	<5	<5	<5	<5
Total Xylenes	<5	<5	<5	<5	<5

All concentrations are in ug/Kg. \* Probable laboratory contamination \*\* Compound also found in laboratory blank

**TABLE A.5.4.**  
Inorganic Data from Septic Tank Borings

SAMPLE ID	REP. OF	SAMPLED	Ag	As	Ba	Cd	Cn	Cr	Cr 6	Cu	Hg	Ni	Pb	Se	Zn	pH	% TS
STB-11-05		10-19-87	<1	<10	<50	<1	<10	23	<0.5	5	<0.5	<5	6	<0.5	24	4.7	82.5
STB-11-10		10-19-87	<1	<10	50	<1	<10	22	<0.5	4	<0.5	<5	2	<0.5	3	4.7	77.0
STB-11-15		10-19-87	3	<10	210	<1	<10	29	<0.5	3	<0.5	<5	2	<0.5	6	4.9	84.3
STB-11-25	STB-11-15	10-19-87	1	<10	170	<1	<10	36	<0.5	4	<0.5	<5	<1	<0.5	5	4.6	79.0
STB-11-20		10-19-87	<1	<10	<50	<1	<10	41	<0.5	1	<0.5	<5	<1	<0.5	7	5.4	86.9
STB-10-04		10-19-87	1	<10	<50	1	<10	39	<0.5	9	<0.5	<5	7	<0.5	16	5.2	73.3
STB-10-09		10-19-87	1	<10	<50	1	<10	25	<0.5	6	<0.5	<5	3	<0.5	17	4.4	76.3
STB-10-14		10-19-87	<1	<10	<50	1	<10	36	<0.5	3	<0.5	<5	3	<0.5	10	4.9	86.0
STB-10-19	STB-10-19	10-19-87	<1	<10	<50	1	<10	47	<0.5	1	<0.5	<5	2	<0.5	9	4.5	88.3
STB-10-24		10-19-87	<1	<10	<50	1	<10	40	<0.5	1	<0.5	<5	1	<0.5	10	4.5	88.8
STB-31-04		10-14-87	<1	<10	<50	<1	<10	35	<0.5	13	<0.5	<5	9	<0.5	9	5.8	75.2
STB-31-09		10-14-87	<1	<10	150	<1	<10	24	<0.5	6	<0.5	<5	8	<0.5	3	4.4	72.1
STB-31-14	STB-31-14	10-14-87	<1	<10	<50	<1	<10	44	<0.5	5	<0.5	<5	4	<0.5	5	4.4	82.9
STB-31-214		10-14-87	<1	<10	90	<1	<10	44	<0.5	4	<0.5	<5	3	<0.5	5	4.4	79.6
STB-31-19		10-14-87	<1	<10	<50	<1	<10	36	<0.5	2	<0.5	<5	4	<0.5	5	4.4	85.4
STB-30-03		10-15-87	<1	<10	<50	<1	<10	23	<0.5	5	<0.5	<5	6	<0.5	2	4.3	78.2
STB-30-08		10-15-87	<1	<10	250	<1	<10	15	<0.5	5	<0.5	<5	8	<0.5	<1	3.8	71.6
STB-30-13		10-15-87	<1	<10	150	<1	<10	26	<0.5	4	<0.5	<5	4	<0.5	3	4.0	75.1
STB-30-18	STB-30-18	10-15-87	<1	<10	<50	<1	<10	29	<0.5	2	<0.5	<5	4	<0.5	4	4.2	85.8
STB-30-19		10-15-87	<1	<10	<50	<1	<10	27	<0.5	2	<0.5	<5	4	<0.5	4	4.3	86.0
STB-61-05		10-26-87	<1	<10	61	<1	<1	35	<0.5	7	<0.5	7	7	<0.5	20	6.4	83.2
STB-61-10		10-26-87	<1	<10	495	<1	<1	46	<0.5	3	<0.5	5	8	<0.5	7	6.3	83.7
STB-61-15	STB-61-15	10-26-87	<1	<10	<50	<1	<1	46	<0.5	2	<0.5	5	4	<0.5	9	5.4	89.8
STB-61-25		10-26-87	<1	<10	<50	<1	<1	56	<0.5	3	<0.5	<5	6	<0.5	9	5.4	89.1
STB-61-20		10-26-87	<1	<10	61	<1	<1	112	<0.5	3	<0.5	5	9	<0.5	14	5.4	86.4
STB-60-04		10-26-87	<1	<10	59	<1	<1	43	<0.5	13	<0.5	13	10	<0.5	188	4.5	82.1
STB-60-09	STB-60-09	10-26-87	<1	<10	<50	<1	<1	64	<0.5	5	<0.5	<5	5	<0.5	11	5.3	83.9
STB-60-24		10-26-87	<1	<10	<50	<1	<1	58	<0.5	3	<0.5	8	2	<0.5	8	5.0	84.2
STB-60-14		10-26-87	<1	<10	<50	<1	<1	57	<0.5	4	<0.5	5	7	<0.5	9	5.4	87.5
STB-60-19		10-26-87	<1	<10	<50	<1	<1	101	<0.5	2	<0.5	5	7	<0.5	12	5.3	84.9
STB-14I-05	STB-14I-15	10-14-87	<1	<10	<50	<1	<10	24	<0.5	4	<0.5	<5	7	<0.5	4	4.7	80.9
STB-14I-10		10-14-87	<1	<10	180	<1	<10	23	<0.5	5	<0.5	<5	7	<0.5	<1	4.2	72.6
STB-14I-15		10-14-87	<1	<10	<50	<1	<10	17	<0.5	2	<0.5	<5	3	<0.5	<1	4.6	84.3
STB-14I-215		10-14-87	<1	<10	<50	<1	<10	21	<0.5	3	<0.5	<5	4	<0.5	<1	4.7	84.7
STB-14I-20		10-14-87	<1	<10	<50	<1	<10	26	<0.5	3	<0.5	<5	4	<0.5	3	4.4	84.5

Metal concentrations are in mg/kg.

GERAGHTY & MILLER, INC.

## **APPENDIX A.6**

### **Background Soil Conditions**

**TABLE A.6.1.**  
Inorganic Data from Background Borings

SAMPLE ID	SAMPLED	Ag	As	Ba	Cd	Cr	Cr 6	Cu	Hg	Ni	Pb	Se	Zn	pH	% TS
IPB3-6	02-11-88	<1	<10	<50	<1	11	<0.5	6	<0.1	<2	10	<0.5	11	4.4	80.5
IPB3-24	02-11-88	<1	<10	<50	<1	30	<0.5	8	<0.1	<2	<5	<0.5	10	4.8	79.6
IPB3-48	02-11-88	<1	<10	<50	<1	32	<0.5	6	<0.1	<2	<5	0.8	5	4.9	82.3
IPB3-72	02-11-88	<1	<10	210	<1	29	<0.5	4	<0.1	<2	<2	1.1	5	5.1	82.5
IPB3-120	02-11-88	<1	<10	<50	<1	42	<0.5	3	<0.1	<2	<5	1.0	7	5.0	90.2
IPB4-6	02-11-88	<1	<10	<50	<1	10	<0.5	5	<0.1	<2	<5	<0.5	9	4.5	82.1
IPB4-24	02-11-88	<1	<10	<50	<1	30	<0.5	8	<0.1	<2	<5	3.2	11	4.7	78.5
IPB4-48	02-11-88	<1	<10	70	<1	29	<0.5	5	<0.1	<2	<5	0.8	5	4.7	81.6
IPB4-72	02-11-88	<1	<10	170	<1	34	<0.5	4	<0.1	<2	<5	0.8	6	5.0	82.6
IPB4-120	02-11-88	<1	<10	<50	<1	44	<0.5	4	<0.1	<2	<5	0.6	5	5.1	89.7
GMB-6-30	11-17-87	<1	<10	<50	<1	74	<1	<1	<0.1	<2	<2	<1	12	---	89.7
GMB-6-40	11-17-87	<1	<10	<50	<1	93	<1	<1	<0.1	<2	4	<1	15	---	88.6
GMB-6-50	11-18-87	<1	<10	<50	<1	73	<1	<1	<0.1	<2	5	<1	19	---	86.6
GMB-6-60	11-18-87	<1	<10	<50	<1	51	<1	<1	<0.1	<2	<1	<1	15	---	85.9
GMB-6-70	11-18-87	<1	<10	<50	<1	77	<1	<1	<0.1	<2	5	<1	45	---	86.4
GMB-7-25	11-18-87	<1	<10	<50	<1	68	<1	3	<0.1	<2	8	<1	49	---	89.3
GMB-7-35	11-18-87	<1	<10	<50	<1	135	<1	<1	<0.1	<2	7	<1	41	---	90.2
GMB-7-45	11-18-87	<1	<10	<50	<1	84	<1	<1	<0.1	<2	6	<1	46	---	85.1
GMB-7-55	11-19-87	<1	<10	<50	<1	47	<1	<1	<0.1	<2	5	<1	58	---	86.9
GMB-7-65	11-19-87	<1	<10	<50	<1	62	<1	<1	<0.1	7	11	<1	65	---	86.2

Metal concentrations are in mg/l. --- Parameter not analyzed.

## **APPENDIX A.7**

**Isoopropanol Disposal Area**

**TABLE A.7.1.**  
Volatile Organic Data from Isopropanol Area Borings

SAMPLE ID	IPB1-6 10-13-87	IPB1-24 10-16-87	IPB1-48 10-16-87	IPB2-6 10-16-87	IPB2-24 10-16-87	IPB2-48 10-16-87
<b>REPLICATE OF:</b>						
<b>PARAMETER</b>						
Chloromethane	<10	<10	<10	<10	<10	<10
Bromomethane	<10	<10	<10	<10	<10	<10
Vinyl Chloride	<10	<10	<10	<10	<10	<10
Chlorethane	<10	<10	<10	<10	<10	<10
Methylene Chloride	203*	126*	73*	185*	80*	102*
Trichlorofluoromethane	5	5	5	5	5	5
1,1-Dichloroethene	5	5	5	5	5	5
1,1-Dichloroethane	5	5	5	5	5	5
trans 1,2-Dichloroethene	5	5	5	5	5	5
Chloroform	5	5	5	5	5	5
1,2-Dichloroethane	5	5	5	5	5	5
1,1,1-Trichloroethane	5	19	12	27	8	5
Carbon Tetrachloride	5	5	5	5	5	5
Bromodichloromethane	5	5	5	5	5	5
1,2-Dichloropropane	5	5	5	5	5	5
trans 1,3-Dichloropropene	5	5	5	5	5	5
Trichloroethene	19**	5	16	22	21*	17
Dibromochloromethane	5	5	5	5	5	5
1,1,2-Trichloropropene	5	5	5	5	5	5
Benzene	5	5	5	5	5	5
cis 1,3-Dichloropropene	5	5	5	5	5	5
2-Chloroethylvinylether	5	5	5	5	5	5
Bromoform	5	5	5	5	5	5
Tetrachloroethene	5	5	5	5	5	5
1,1,2,2-Tetrachloroethane	5	5	5	5	5	5
Toluene	5	5	5	5	5	5
Chlorobenzene	5	5	5	5	5	5
Ethylbenzene	5	5	5	5	5	5
Xylenes (total)	5	5	5	5	5	5

All concentrations are in ug/Kg    \* Probable laboratory contamination    \*\* Compound found in laboratory blank

**TABLE A.7.2.**  
Inorganic Data from Isopropanol Borings

WELL ID	SAMPLED	Ag	As	Ba	Cd	Cn	Cr	Cr 6	Cu	Hg	Ni	Pb	Se	Zn	pH	% TS
IPB1-6	10-13-87	<1	4	<100	<1	<1	17	<1	18	0.1	4	130	<0.5	34	4.9	80.4
IPB1-24	10-13-87	<1	10	<100	<1	<1	30	<1	7	<0.1	4	23	<0.5	28	5.0	99.7
IPB1-48	10-13-87	<1	20	<100	<1	<1	41	<1	8	<0.1	<1	8	<0.5	50	4.8	77.5
IPB2-6	10-13-87	<1	10	<100	<1	<1	24	<1	10	<0.1	<1	45	<0.5	47	4.8	87.6
IPB2-24	10-13-87	<1	20	<100	<1	<1	32	<1	7	<0.1	<1	19	<0.5	25	4.9	83.2
IPB2-48	10-13-87	<1	20	140	<1	<1	56	<1	8	0.1	<1	12	<0.5	22	4.7	78.7

Metal concentrations are in mg/kg.

GERAGHTY & MILLER, INC.

## **APPENDIX A.8**

### **Screened Interval Samples**

TABLE A.8.1.  
Volatile Organics Data from Screen Interval Soils

SAMPLE ID	GM-6S*	GM-7S	GM-8S	GM-9S1	GM-9S2	GM-10S	GM-11S	GM-11S2	GM-12S-9
DATE SAMPLED	11-25-87	1-13-88	2-17-88	1-28-88	1-29-88	2-15-88	2-22-88	2-22-88	12-2-87
REPLICATE OF:									
<b>PARAMETER</b>									
Benzene	5			1			1		
Carbon Tetrachloride	5			1			1		
Chlorobenzene	5			1			1		
1,2-Dichloroethane	5			1			1		
1,1,1-Trichloroethane	5			1			1		
1,1-Dichloroethane	5			1			1		
1,1,2-Trichloroethane	5			1			1		
1,1,2,2-Tetrachloroethane	5			1			1		
Chloroethane	<10			10			10		
2-Chloroethylvinylether	<10			10			10		
Chloroform	5			1			1		
1,1-Dichloroethene	5			1			1		
trans 1,2-Dichloroethene	5			1			1		
Ethylbenzene	5			1			1		
1,3-Dichloropropene	5			1			1		
trans 1,3-Dichloropropene	5			1			1		
cis 1,3-Dichloropropene	5			1			1		
1,2-Dichloropropene	5			1			1		
Methylene Chloride	5			1			1		
Methyl Chloride	<10			10			10		
Methyl Bromide	<10			10			10		
Bromoform	5			1			1		
Dichlorobromomethane	5			1			1		
Chlorodibromomethane	5			1			1		
Tetrachloroethene	5			1			1		
Trichloroethene	5			1			1		
Toluene	5			1			1		
Vinyl Chloride	<10			10			10		
Xylenes (o-,m-,p-)	5			7			5		
Trichlorofluoromethane	5			1			1		

All concentrations are in ug/Kg. GM-6S\* appears as GM-6A-100 and GM-6B-100 on chain of custody and as GM-6A-100 on certificate of analysis.

TABLE A.8.1. (cont.)  
Volatile Organics Data from Screen Interval Soils

SAMPLE ID	GM-13S-9	GM-14S-9	GM-15S	GMP-16S	GMP-17S	GM-18S
DATE SAMPLED	12-2-87	12-2-87	11-25-87	11-23-87	11-25-87	1-22-88
REPLICATE OF:						
<hr/>						
PARAMETER						
Benzene	5	5	5	5	5	<1
Carbon Tetrachloride	5	5	5	5	5	<1
Chlorobenzene	5	5	5	5	5	<1
1,2-Dichloroethane	5	5	5	5	5	<1
1,1,1-Trichloroethane	5	5	5	5	5	<1
1,1-Dichloroethane	5	5	5	5	5	<1
1,1,2-Trichloroethane	5	5	5	5	5	<1
1,1,2,2-Tetrachloroethane	5	5	5	5	5	<1
Chloroethane	<10	<10	<10	<10	<10	<10
2-Chloroethylvinylether	<10	<10	<10	<10	<10	<10
Chloroform	5	5	5	5	5	<1
1,1-Dichloroethene	5	5	5	5	5	<1
trans 1,2-Dichloroethene	5	5	5	5	5	<1
Ethylbenzene	5	5	5	5	5	<1
1,3-Dichloropropene	5	5	5	5	5	<1
trans 1,3-Dichloropropene	5	5	5	5	5	<1
cis 1,3-Dichloropropene	5	5	5	5	5	<1
1,2-Dichloropropane	5	5	5	5	5	<1
Methylene Chloride	5	5	5	5	5	<1
Methyl Chloride	5	5	5	5	5	<10
Methyl Bromide	<10	<10	<10	<10	<10	<10
Bromoform	5	5	5	5	5	<1
Dichlorobromomethane	5	5	5	5	5	<1
Chlorodibromomethane	5	5	5	5	5	<1
Tetrachloroethene	5	5	5	5	5	<1
Trichloroethene	5	5	5	5	5	<1
Toluene	5	5	5	5	5	<1
Vinyl Chloride	<10	<10	<10	<10	<10	<10
Xylenes (o-,m-,p-)	5	5	5	5	5	<1
Trichlorofluoromethane	<5	<5	<5	<5	<5	<5

All concentrations are in ug/Kg. GM-6S\* appears as GM-6A-100 and GM-6B-100 on chain of custody and as GM-6A-100 on certificate of analysis.

**TABLE A.8.2.**  
Inorganic Data from Screen Interval Soils

SAMPLE ID	SAMPLED	Ag	As	Ba	Cd	Cr	Cr 6	Cu	Hg	Ni	Pb	Se	Zn	pH	% TS
GM-6S*	11-20-87	<1	<10	<50	<1	42	<1	2	<0.1	9	2	<1	57	6.1	80.3
GM-7S	01-13-88	<1	<10	<50	<1	50	<0.5	2	<0.1	17	5	<1	80	5.3	82.3
GM-8S	02-17-88	<1	<10	<50	<1	37	<0.5	5	<0.1	<2	<5	<0.5	15	5.7	78.1
GM-9S1	01-28-88	<1	<10	<50	<1	13	<0.5	2	<0.1	15	14	<1	14	4.8	78.5
GM-9S2	01-29-88	<1	<10	<50	<1	6	<0.5	3	<0.1	15	16	<1	26	4.7	78.8
GM-10S	02-15-88	<1	<10	<50	<1	49	<0.5	5	<0.1	<2	<5	<0.5	26	5.9	79.4
GM-11S	02-22-88	<1	<10	<50	<1	9	<0.5	3	<0.1	9	<5	<0.5	14	5.4	87.7
GM-11S2	02-22-88	<1	<10	<50	<1	6	<0.5	4	<0.1	9	<5	<0.5	22	4.7	81.6
GM-12S-9	12-02-87	<1	<10	<50	<1	51	<1	<1	<0.1	3	3	<1	19	5.6	77.0
GM-13S-9	12-02-87	<1	<10	<50	<1	41	<1	4	<0.1	<2	9	<1	19	6.2	74.1
GM-14S-9	12-02-87	<1	<10	<50	<1	22	<1	<1	<0.1	<2	<2	<1	9	4.2	72.8
GM-15S	11-25-87	<1	<10	<50	<1	28	<1	2	<0.1	<2	2	<1	12	4.3	72.6
GM-18S	01-22-88	<1	<10	<50	<1	10	<0.5	2	<0.1	13	8	<1	22	4.0	76.8
GMP-16S	11-23-87	<1	<10	<50	<1	37	<1	2	<0.1	<2	3	<1	16	6.1	74.4
GMP-17S	11-25-87	<1	<10	<50	<1	34	<1	2	<0.1	<2	<2	<1	16	5.9	74.5

Metal concentrations are in mg/Kg. \* Sample appears as GM-6A-100 and GM-6B-100 on the chain of cust. and as GM-6A-100 on the cert. of anal.

**Dry Well and Septic Tank/Pit  
Metal and pH Profiles**

**APPENDIX A.9**

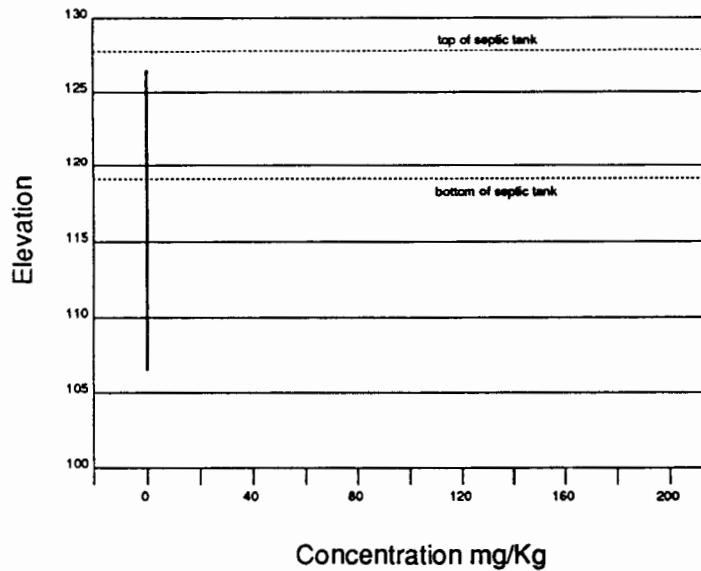


GERAGHTY & MILLER, INC.

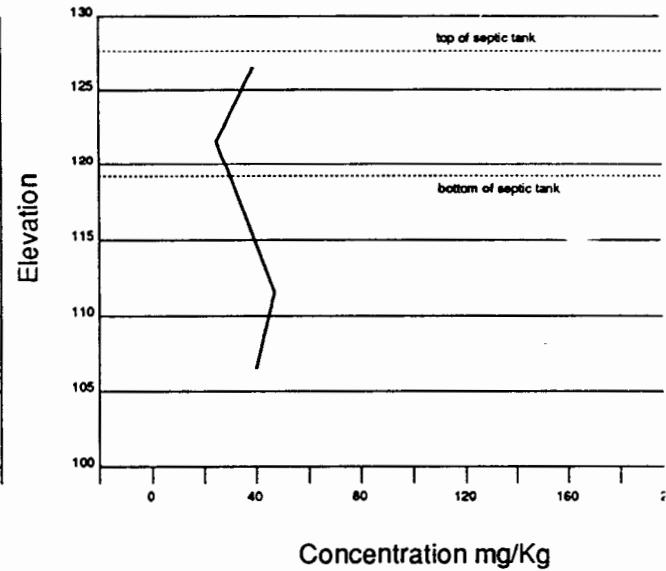
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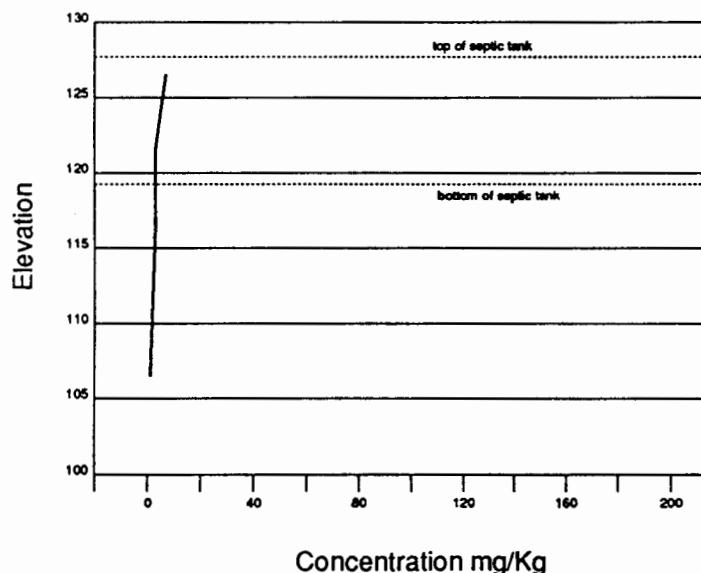
BARIUM



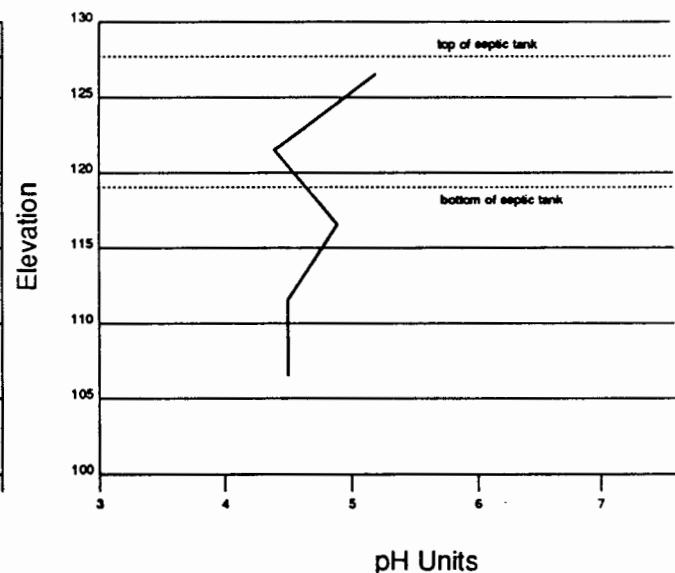
CHROMIUM



LEAD



pH

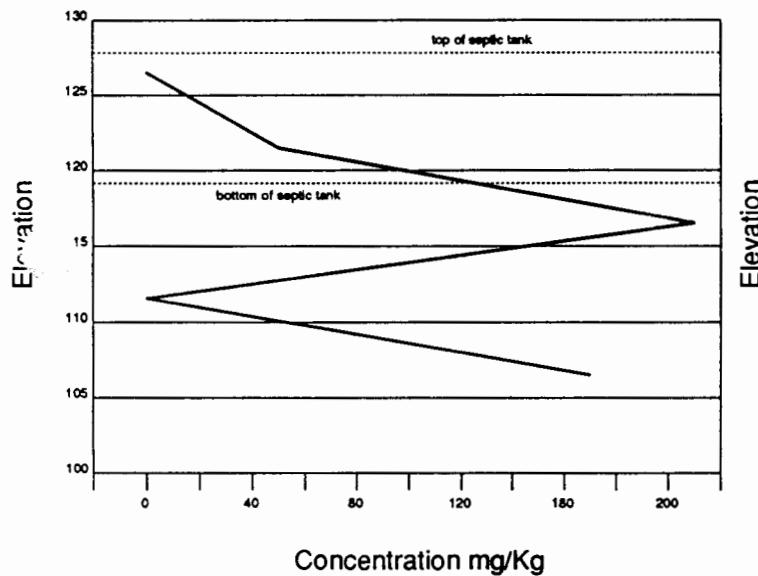


GERAGHTY & MILLER, INC.

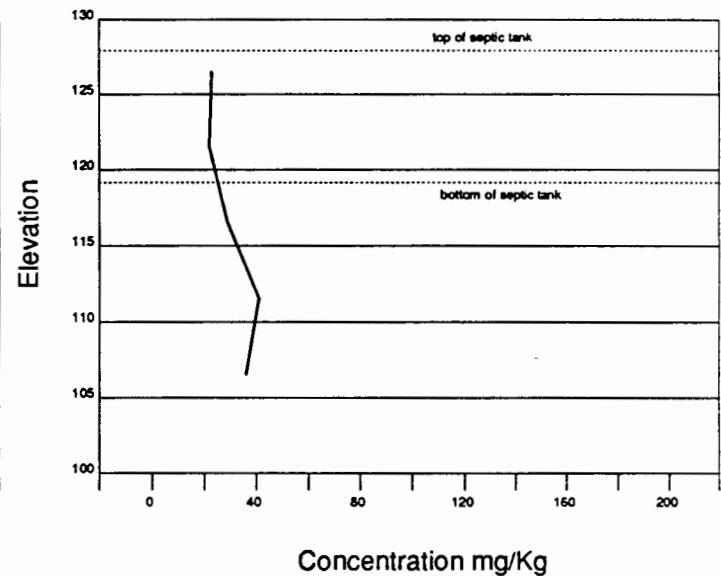
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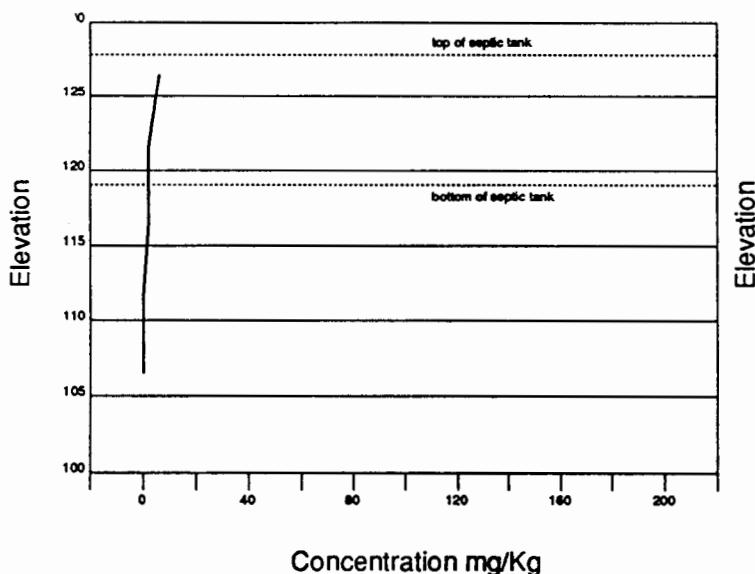
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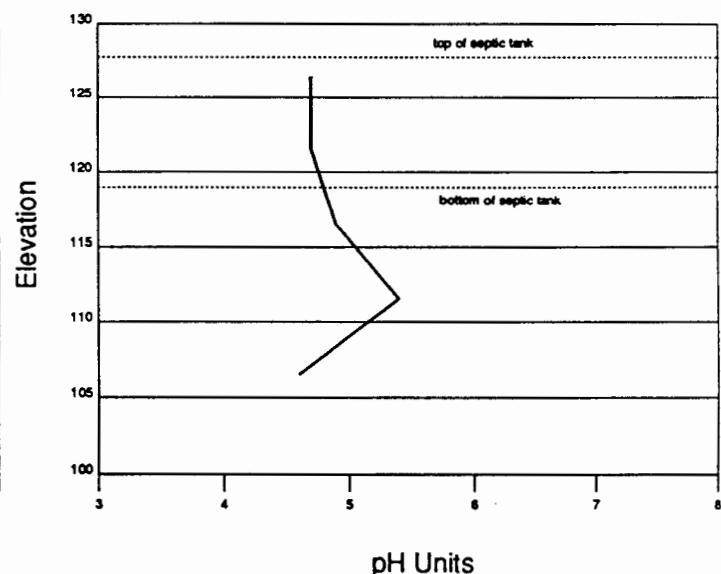
CHROMIUM



LEAD



pH

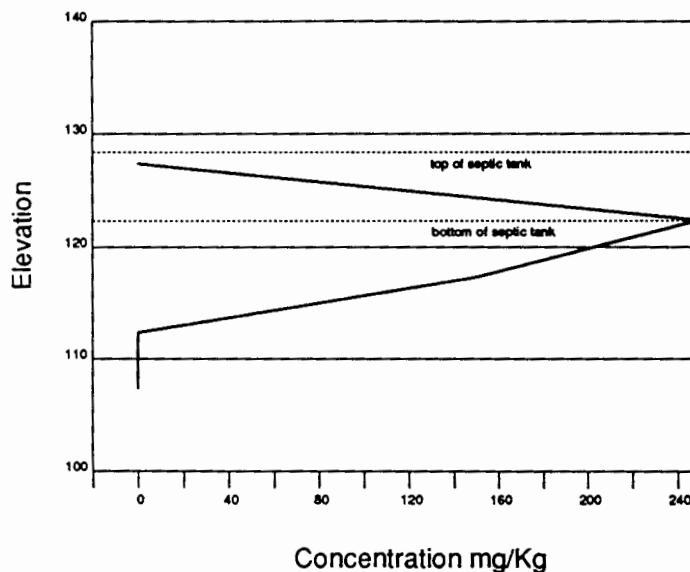


GERAGHTY & MILLER, INC.

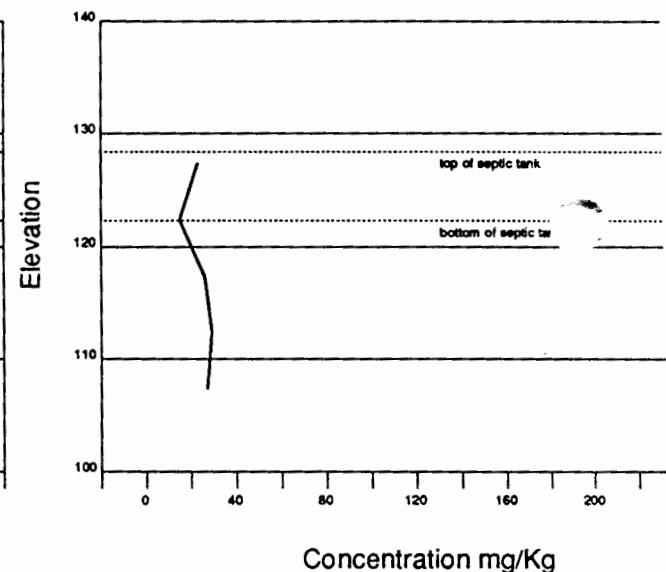
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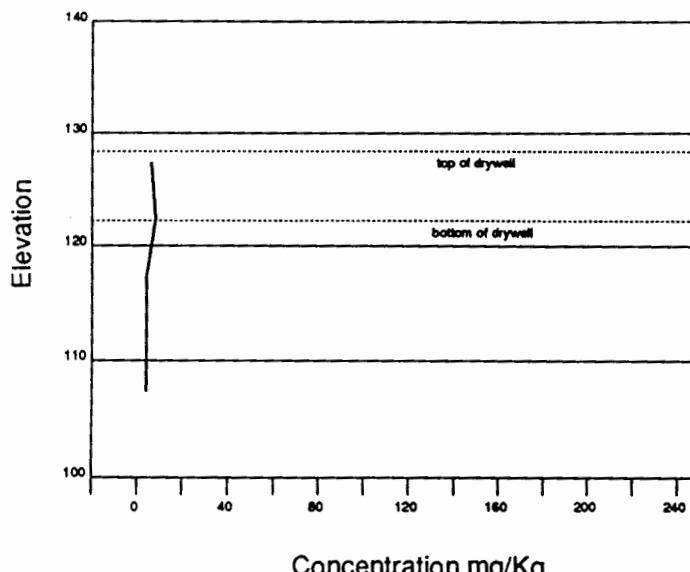
BARIUM



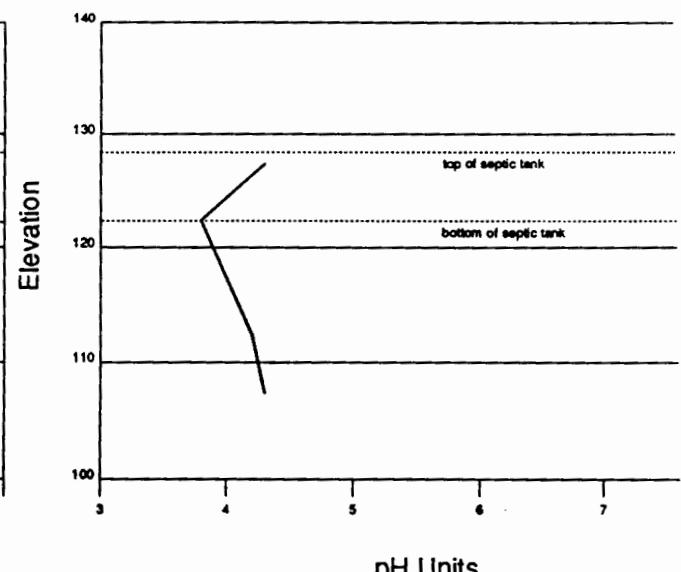
CHROMIUM



LEAD



pH

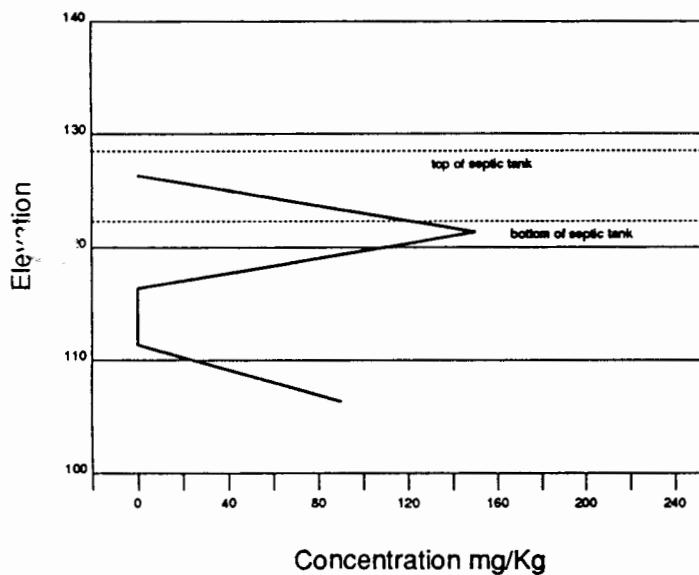


GERAGHTY & MILLER, INC.

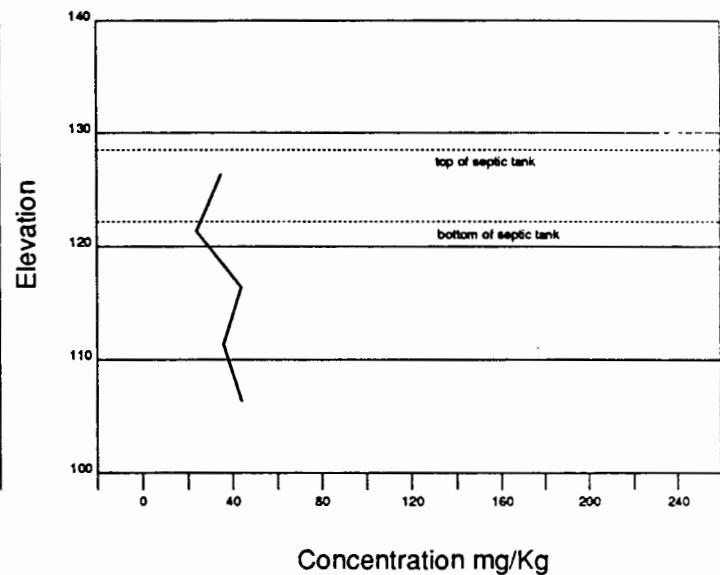
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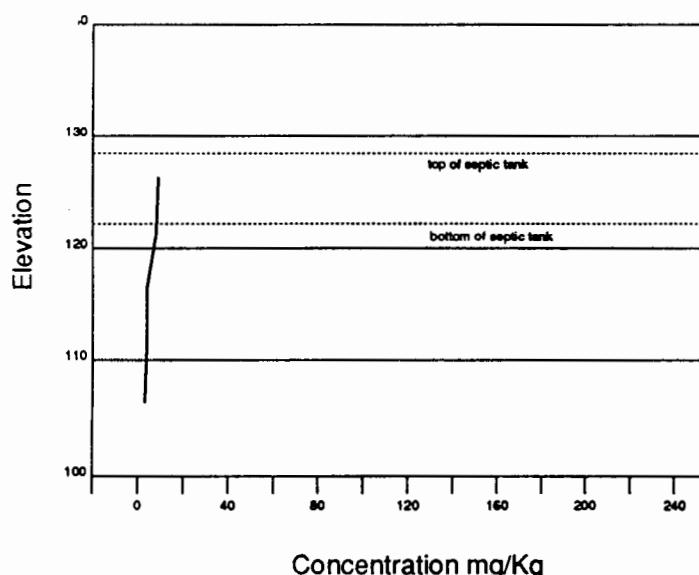
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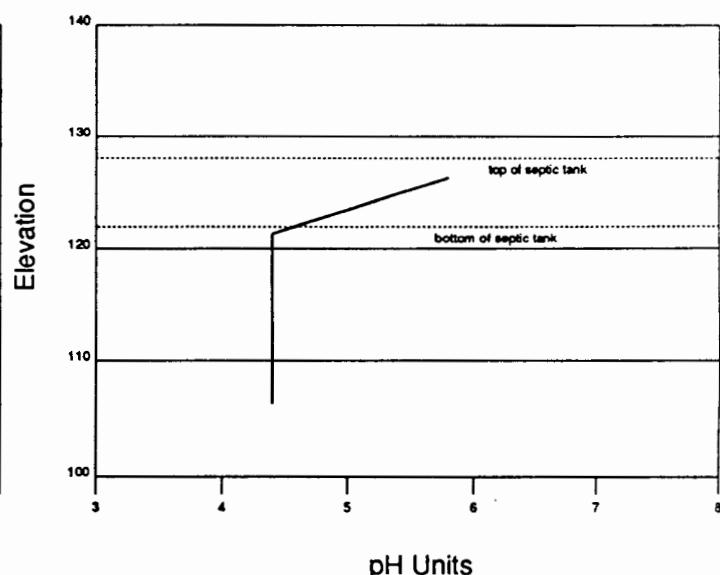
CHROMIUM



LEAD



pH

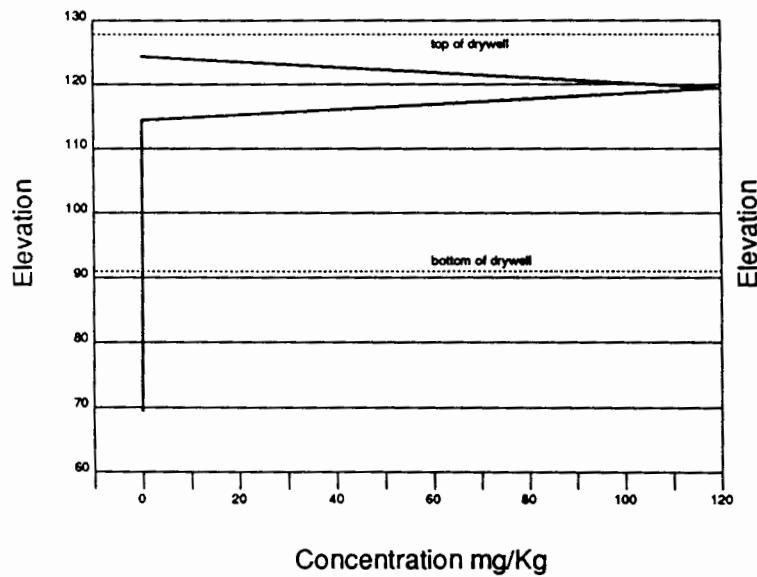


GERAGHTY & MILLER, INC.

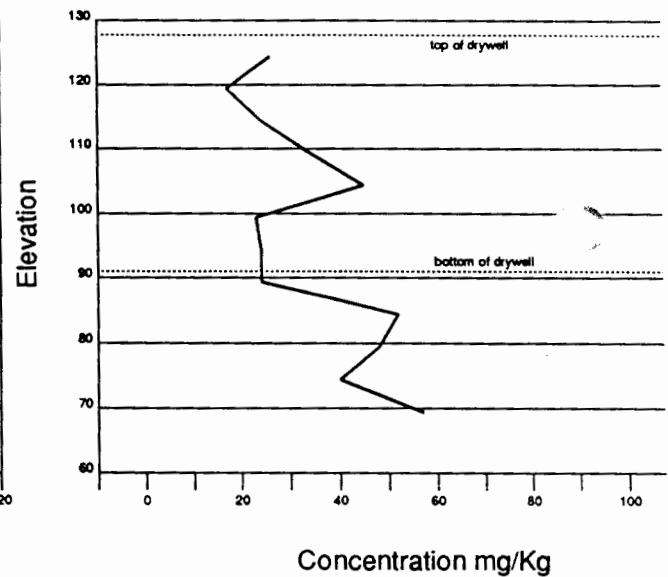
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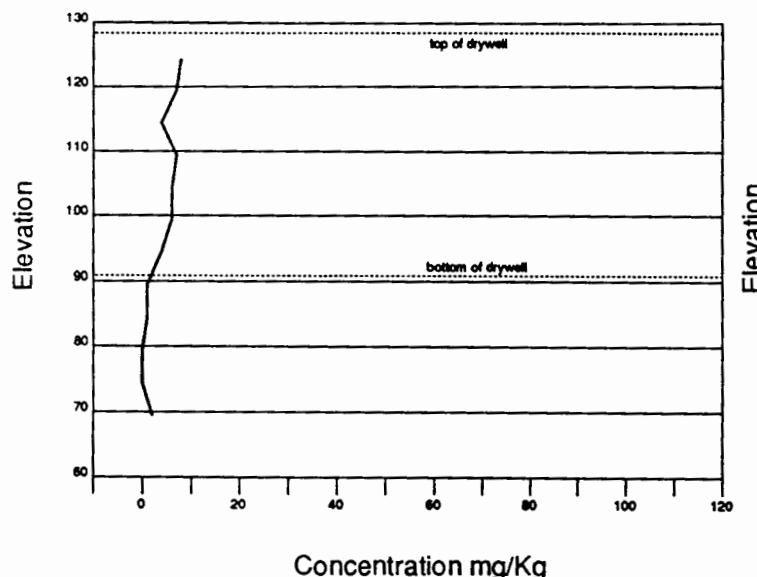
BARIUM



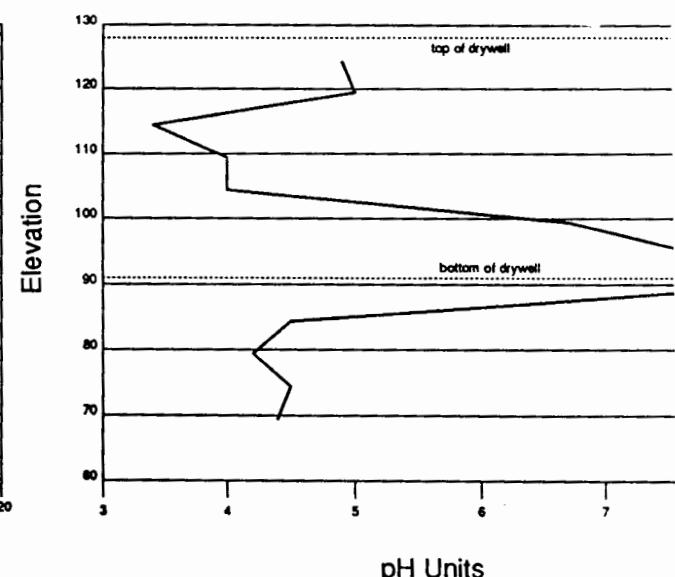
CHROMIUM



LEAD



pH

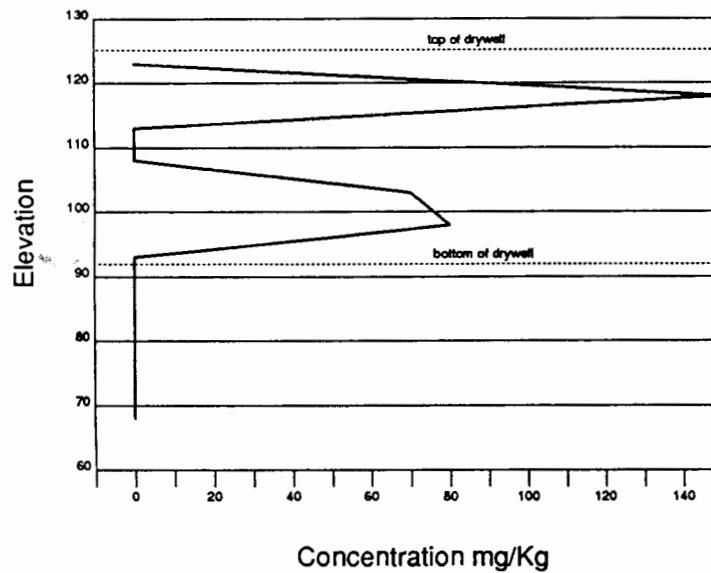


GERAGHTY & MILLER, INC.

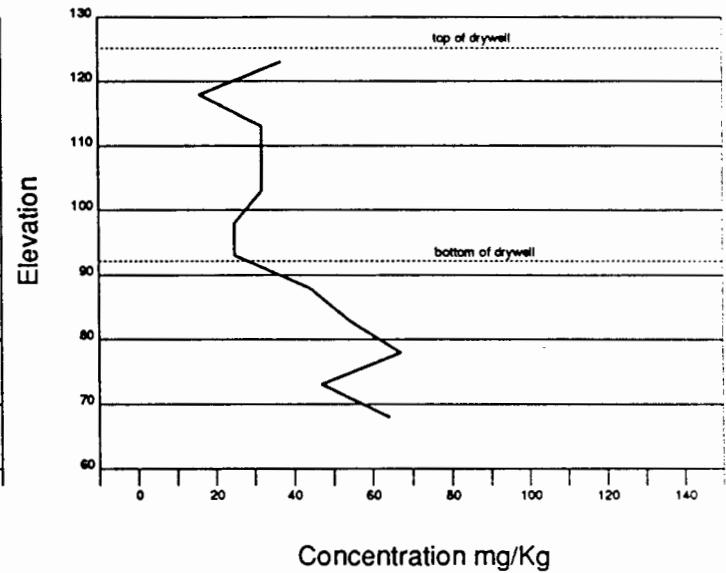
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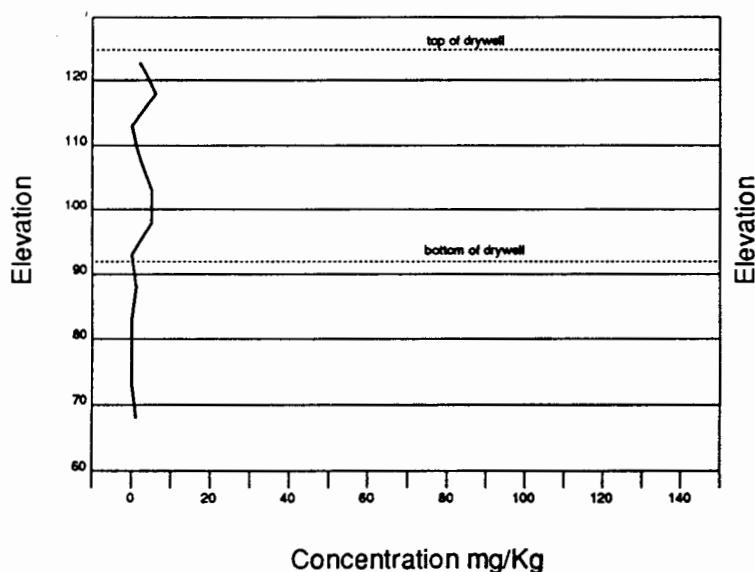
BARIUM



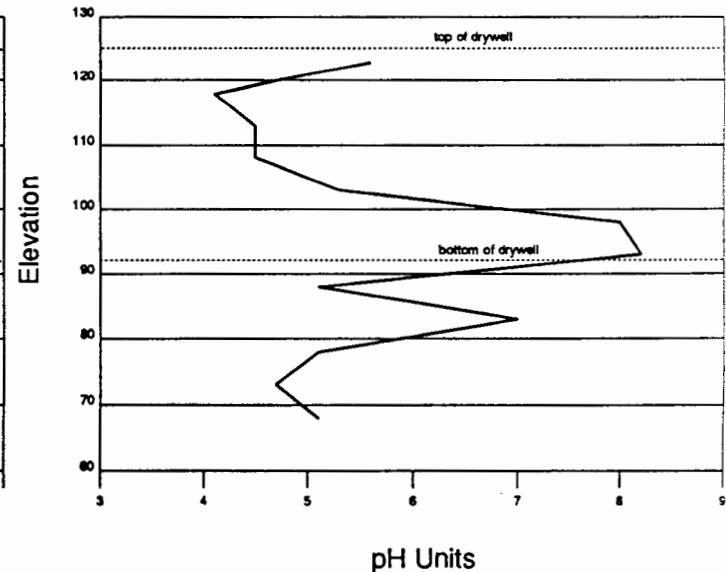
CHROMIUM



LEAD



pH

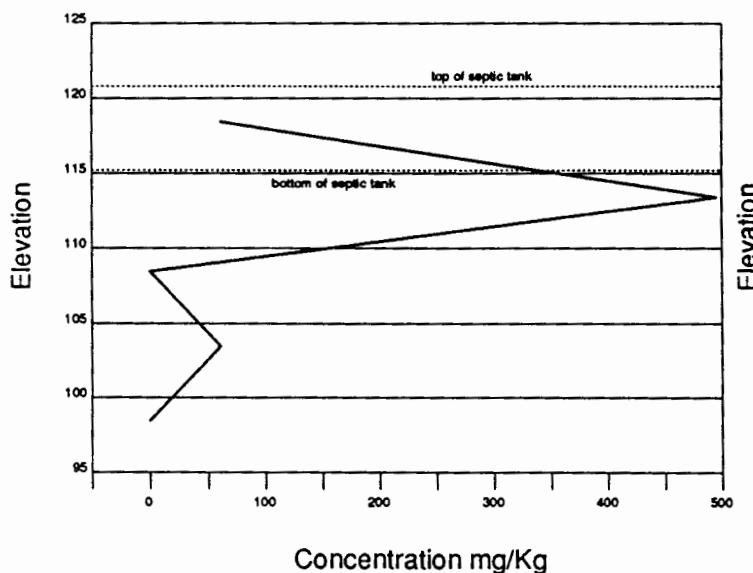


GERAGHTY & MILLER, INC.

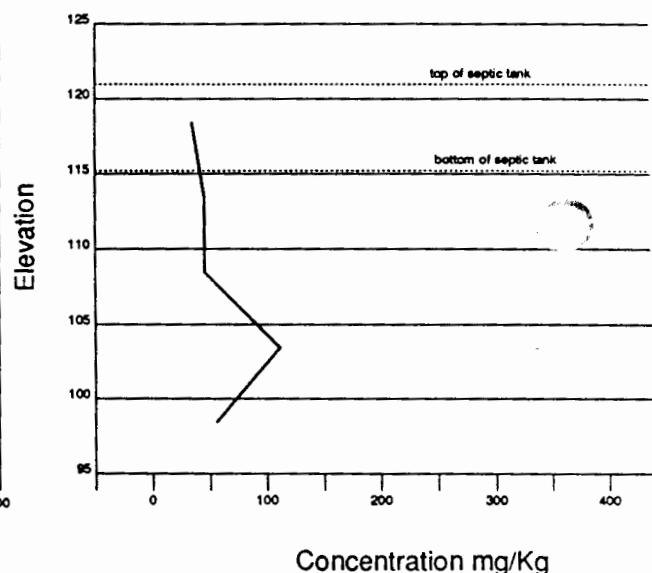
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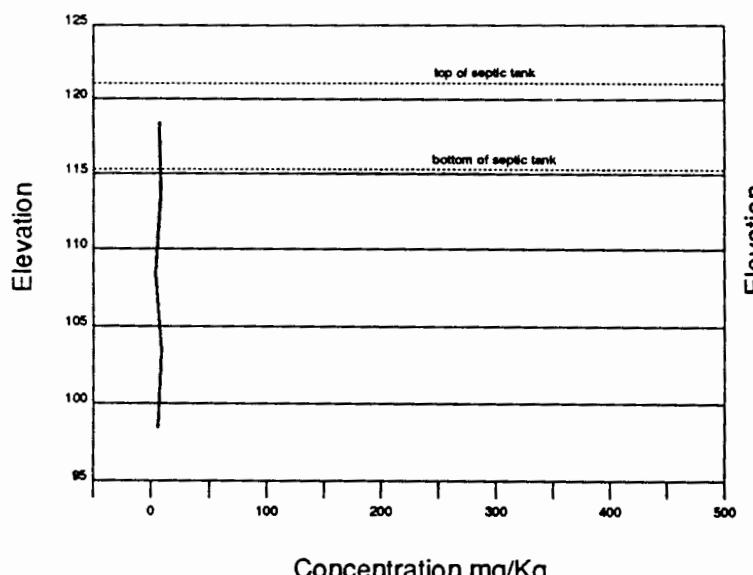
BARIUM



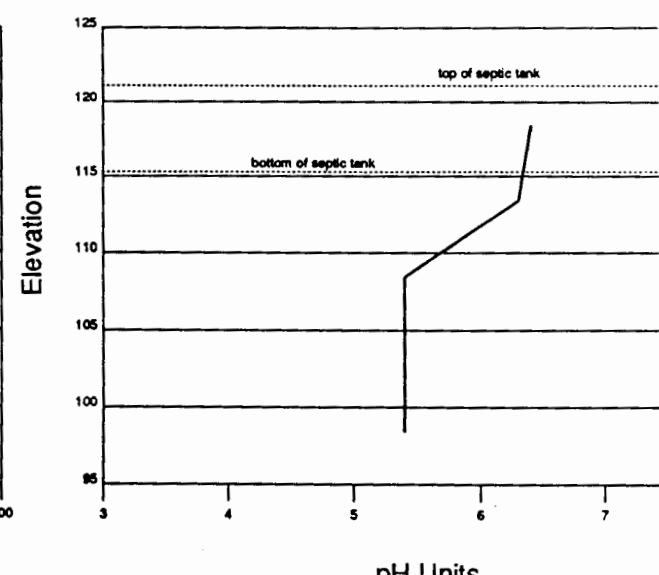
CHROMIUM



LEAD



pH

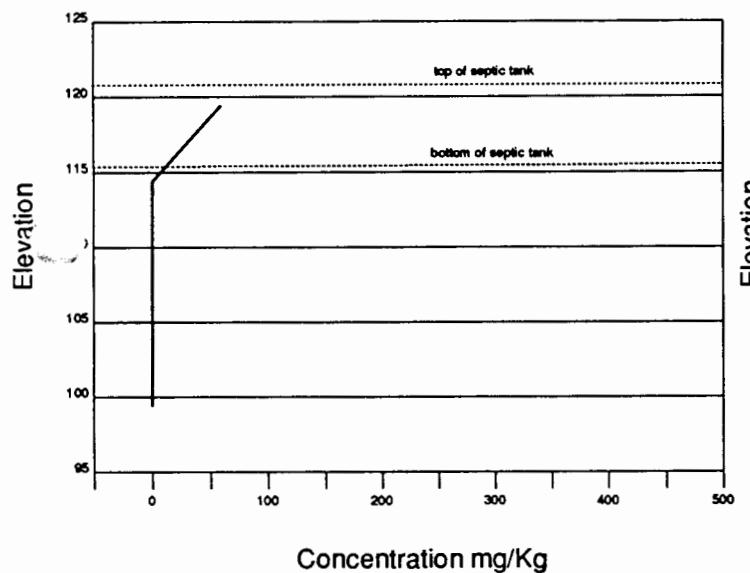


GERAGHTY & MILLER, INC.

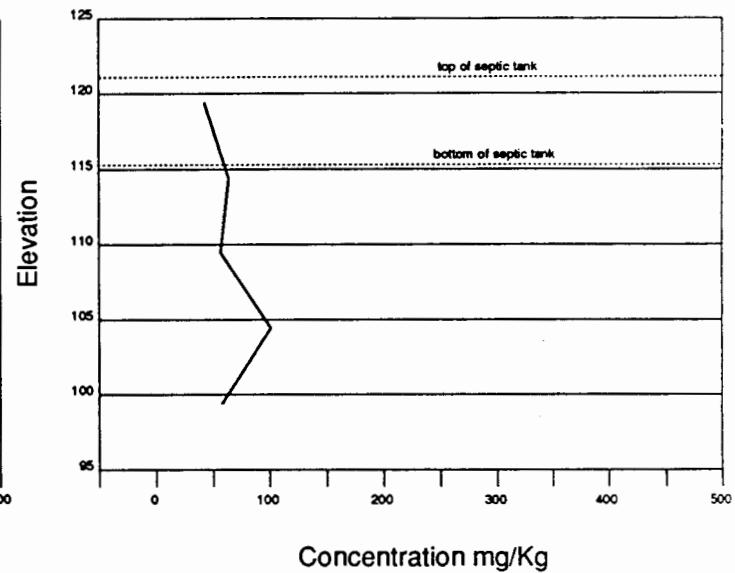
# SEPTIC TANK BORING #6, OUTLET

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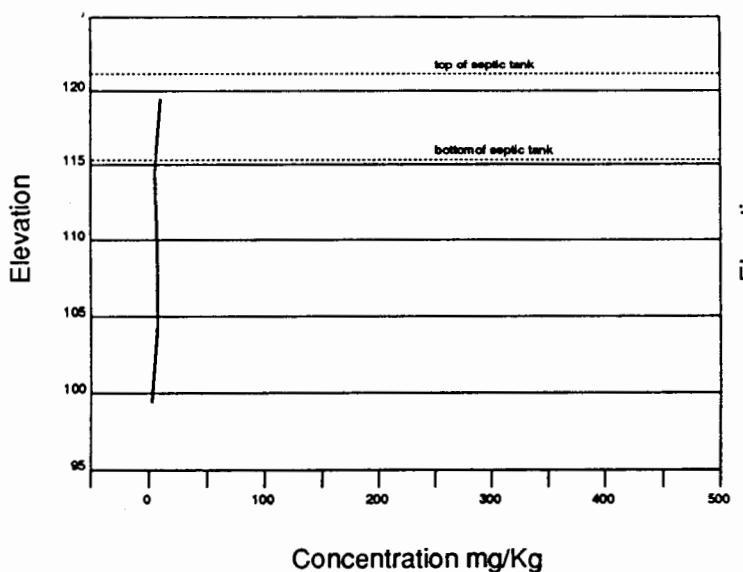
BARIUM



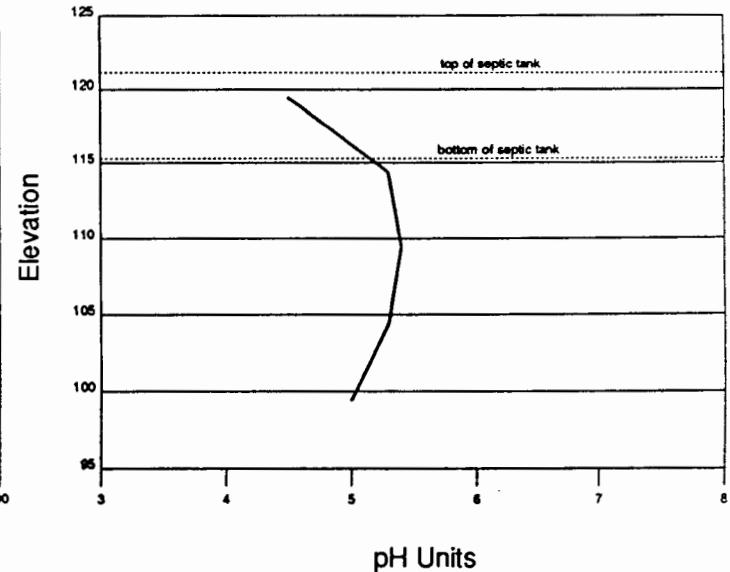
CHROMIUM



LEAD



pH

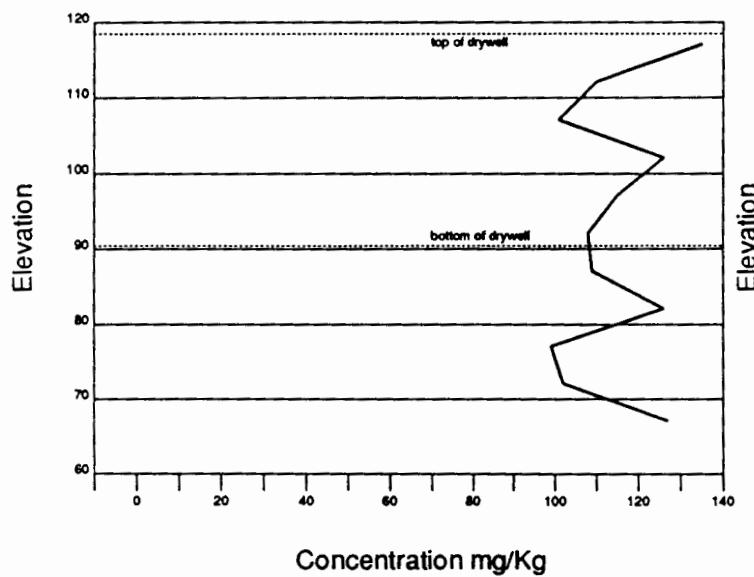


GERAGHTY & MILLER, INC.

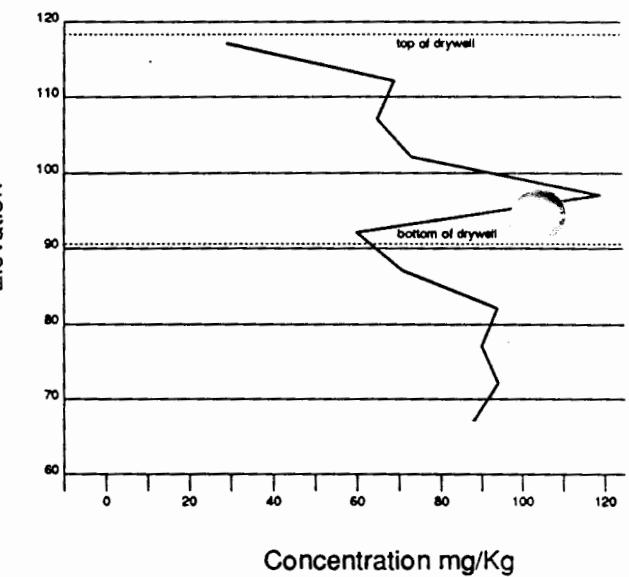
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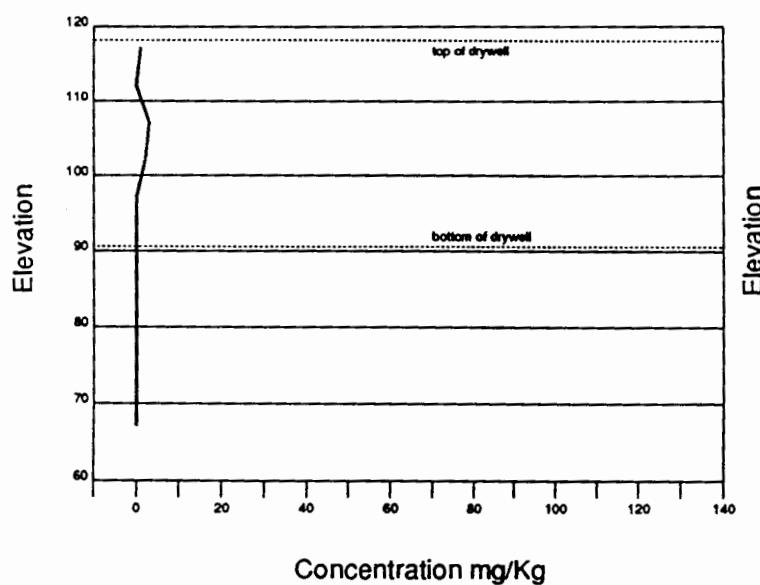
BARIUM



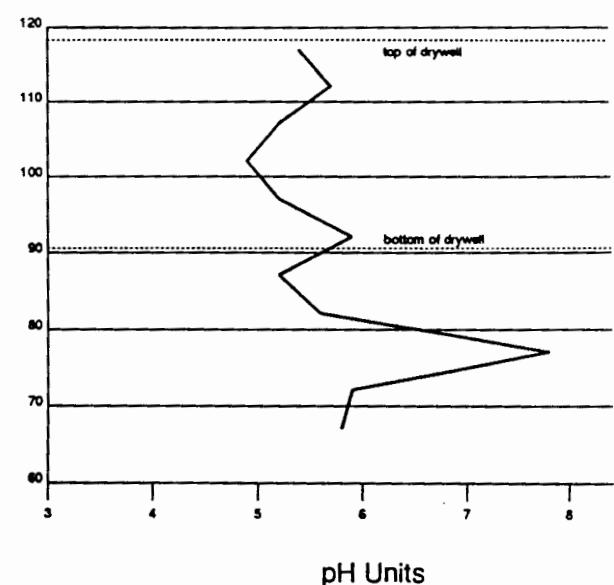
CHROMIUM



LEAD



pH

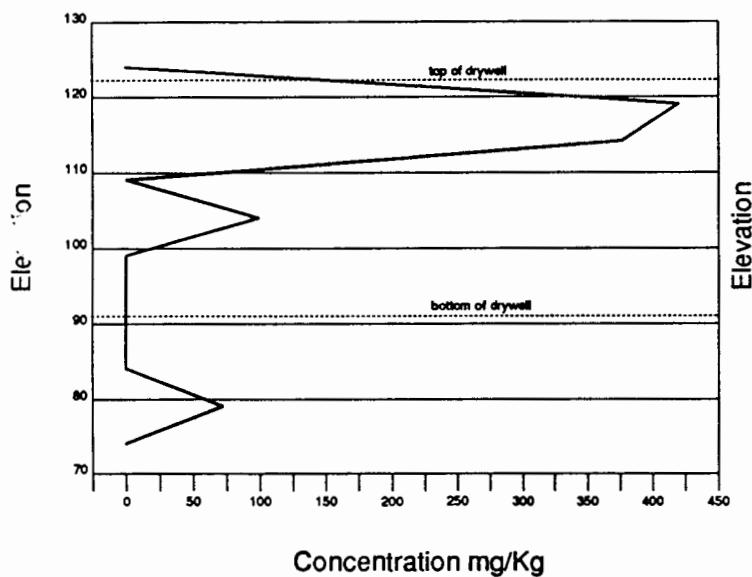


GERAGHTY & MILLER, INC.

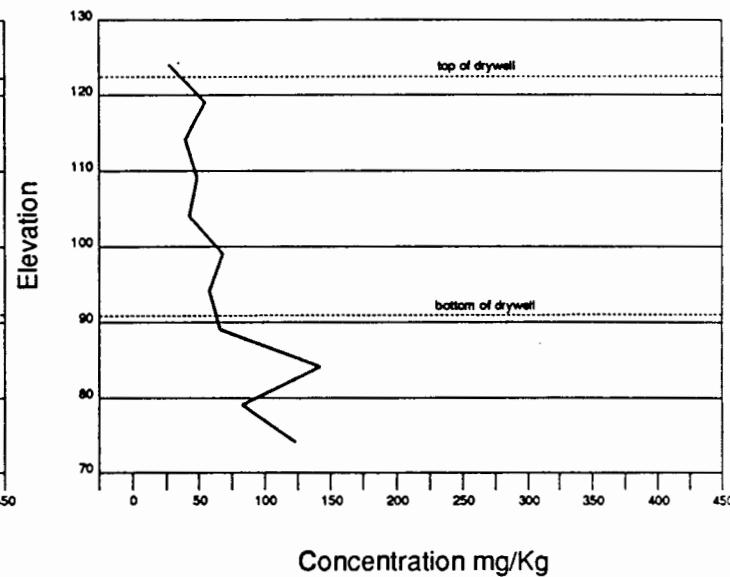
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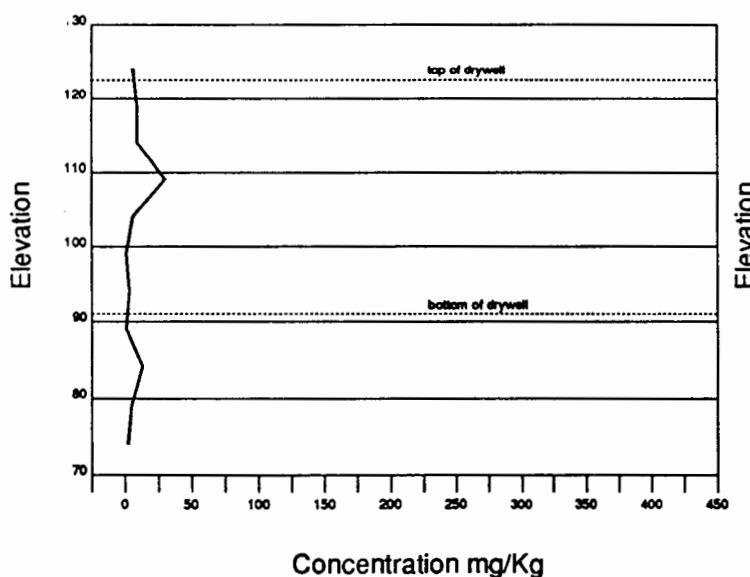
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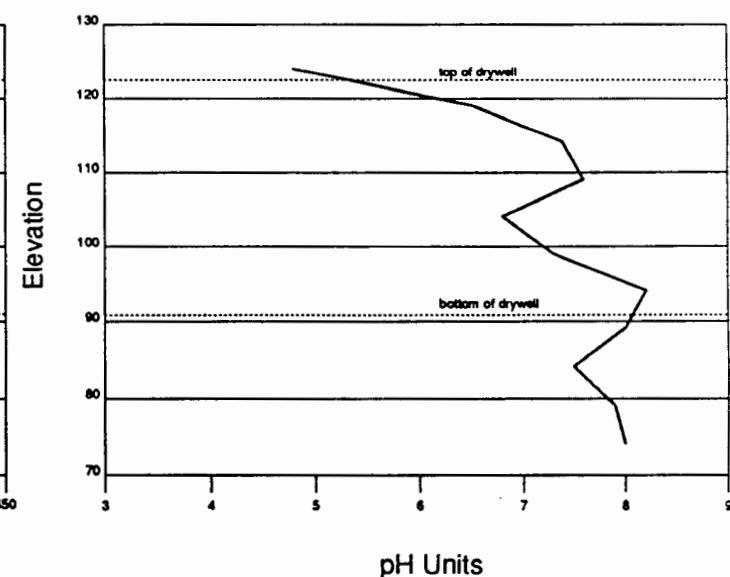
CHROMIUM



LEAD



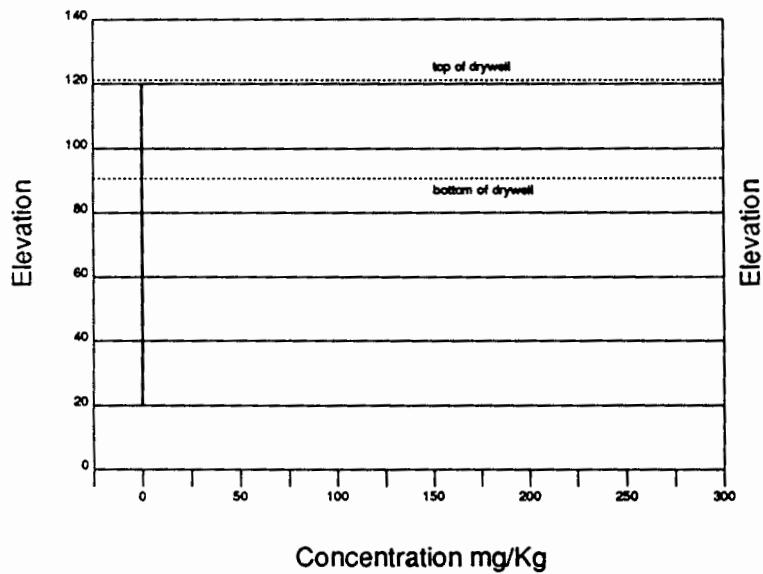
pH



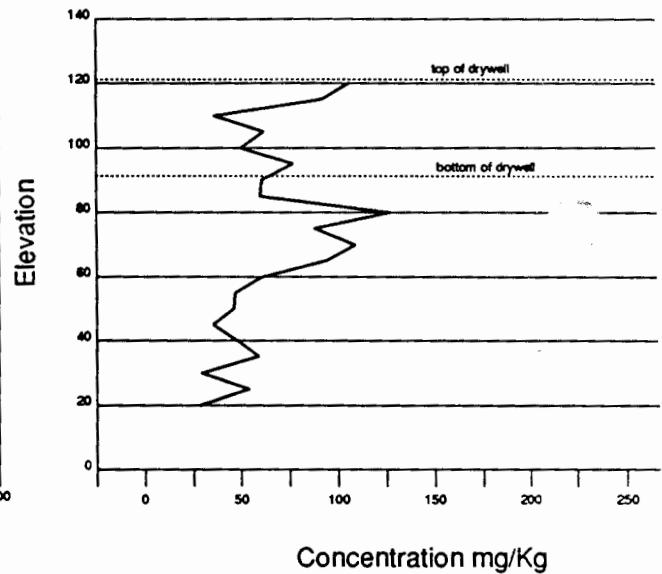
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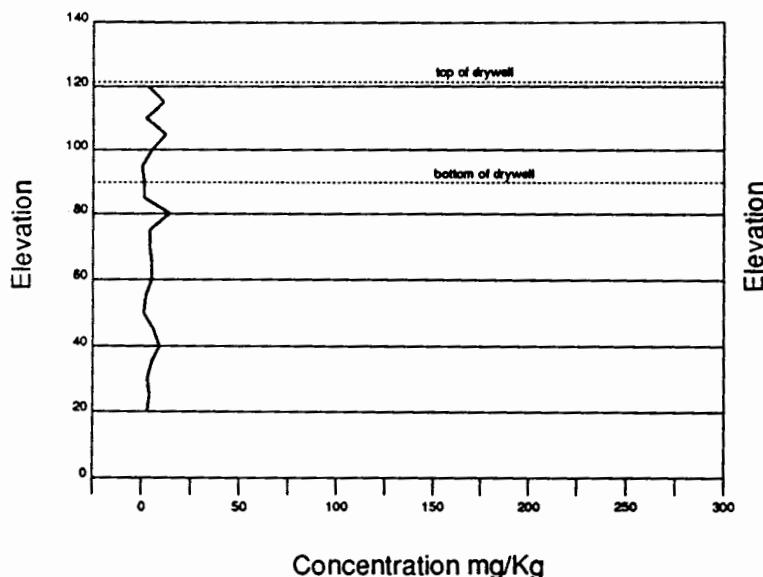
### BARIUM



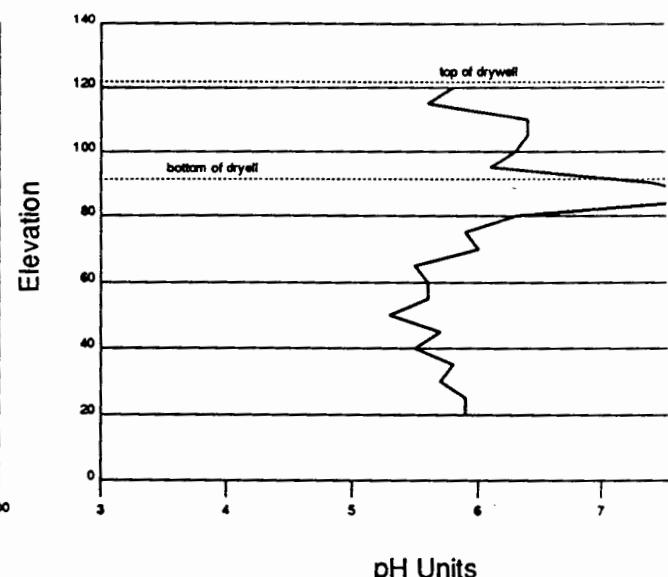
### CHROMIUM



### LEAD



### pH

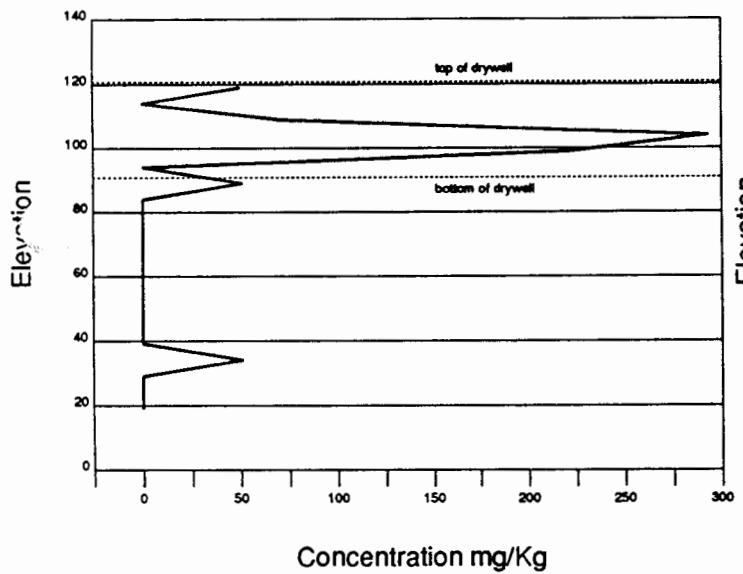


GERAGHTY & MILLER, INC.

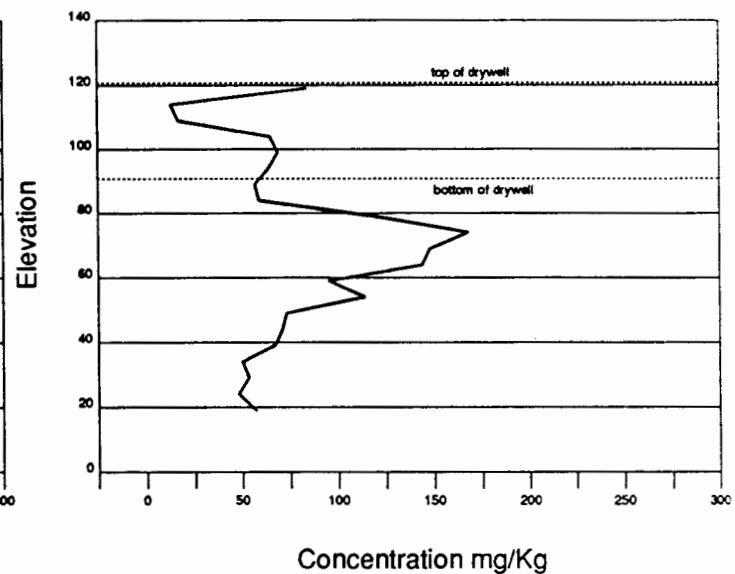
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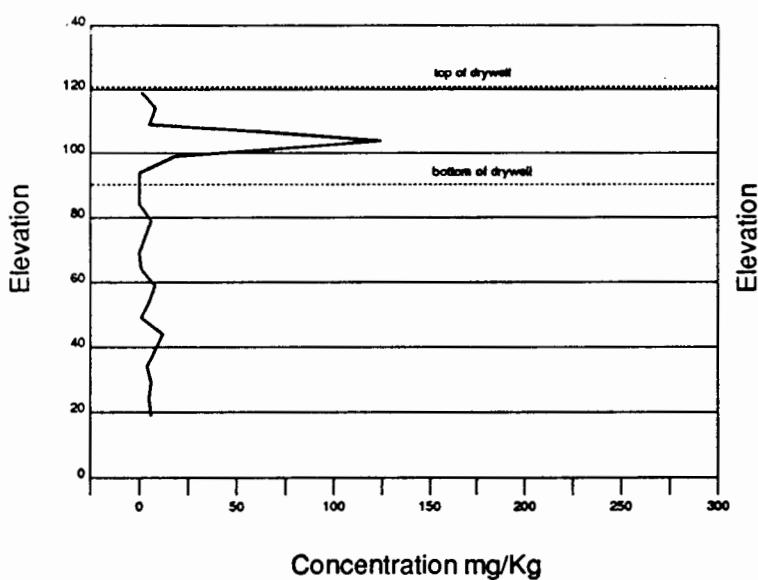
BARIUM



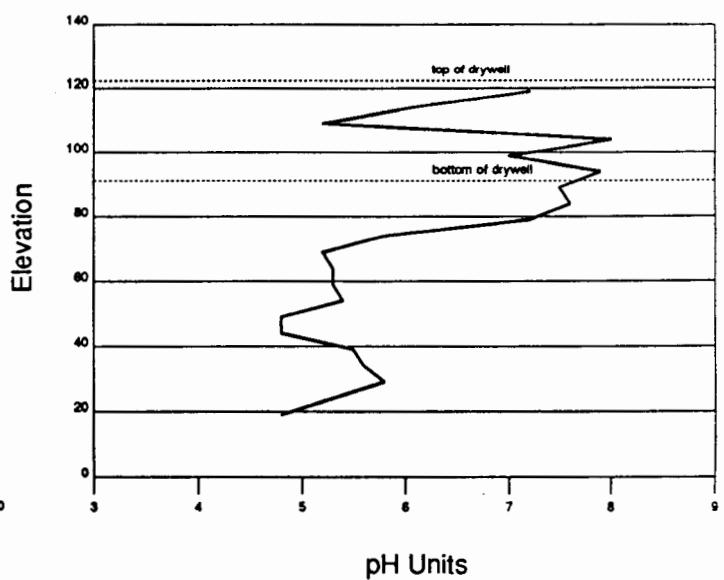
CHROMIUM



LEAD



pH

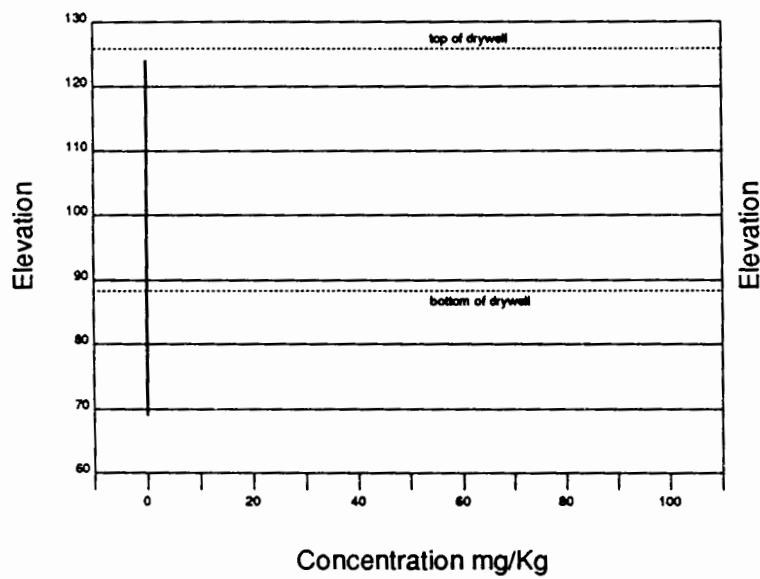


GERAGHTY & MILLER, INC.

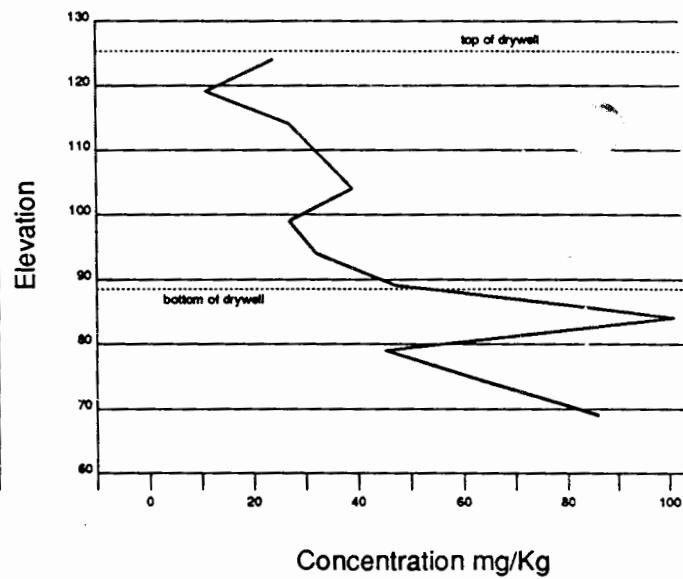
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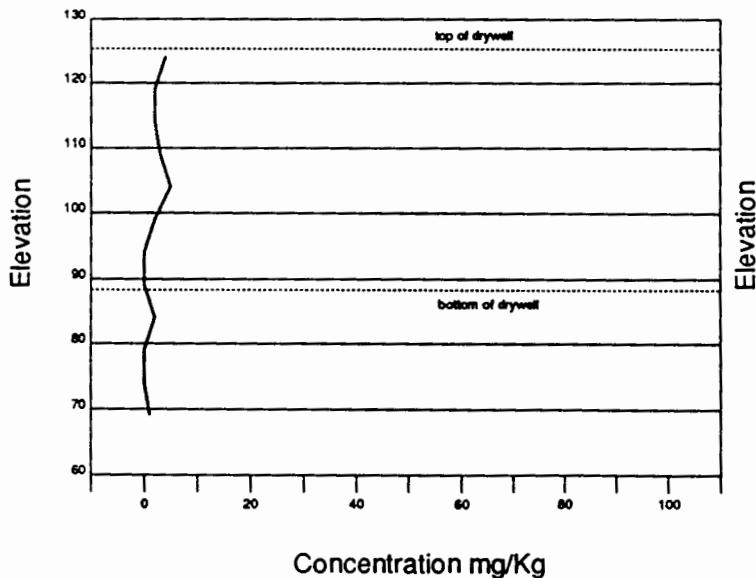
BARIUM



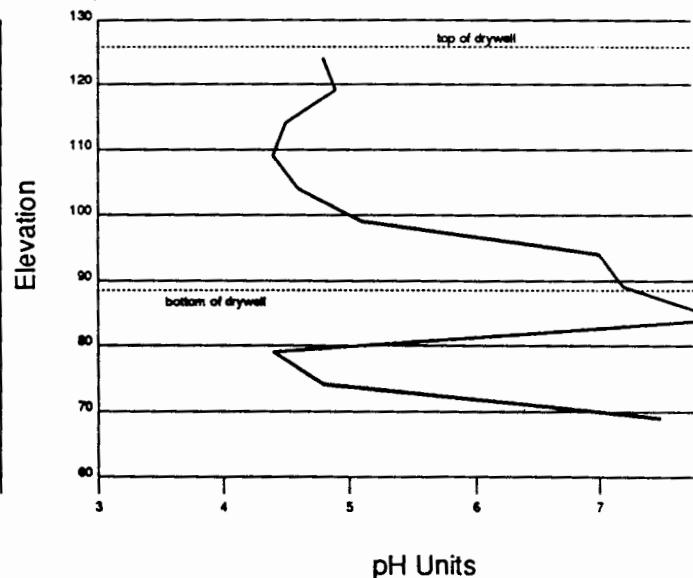
CHROMIUM



LEAD



pH

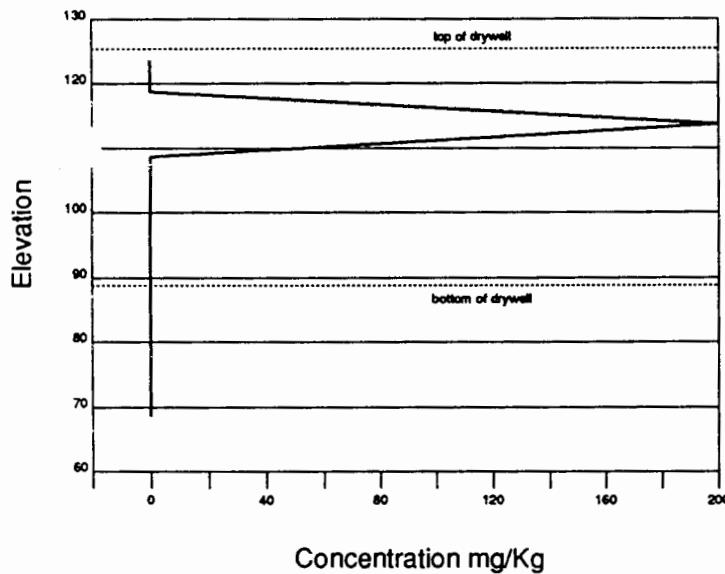


GERAGHTY & MILLER, INC.

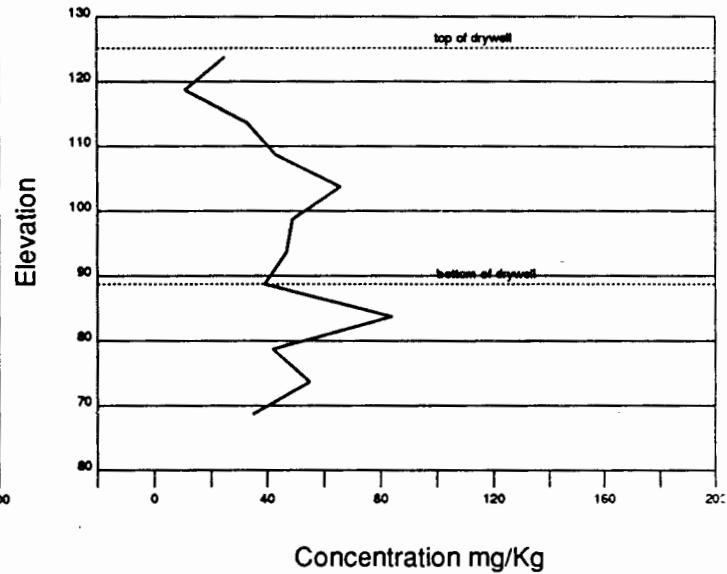
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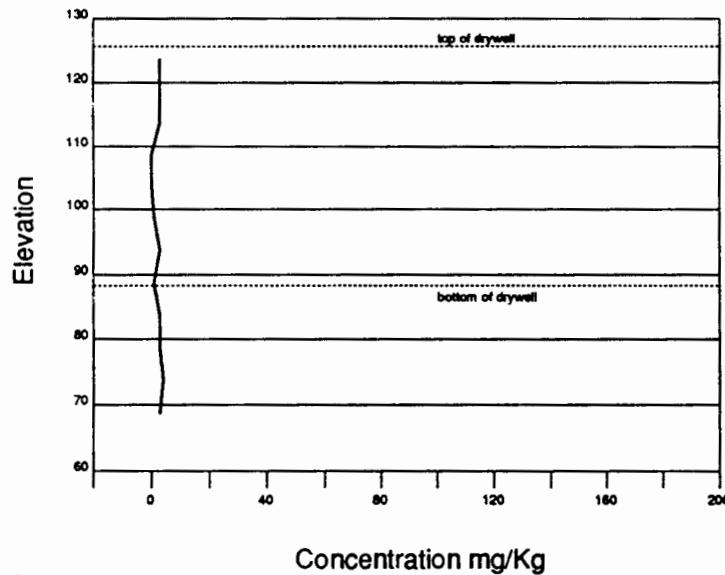
BARIUM



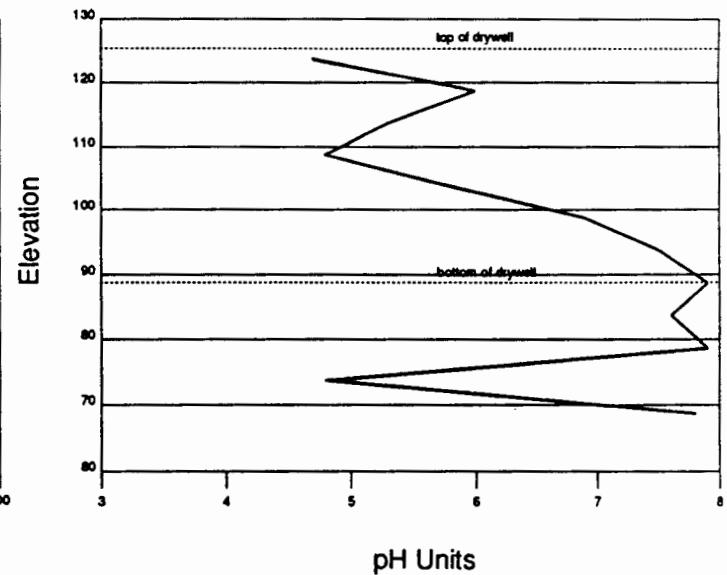
CHROMIUM



LEAD



pH

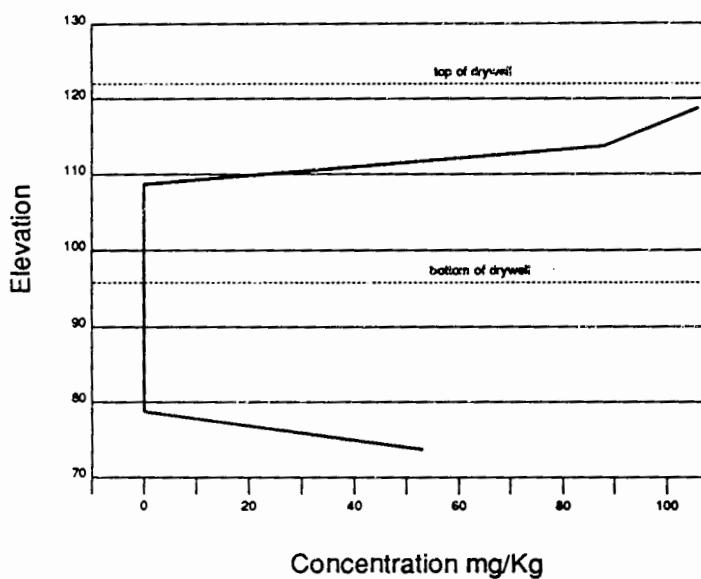


GERAGHTY & MILLER, INC.

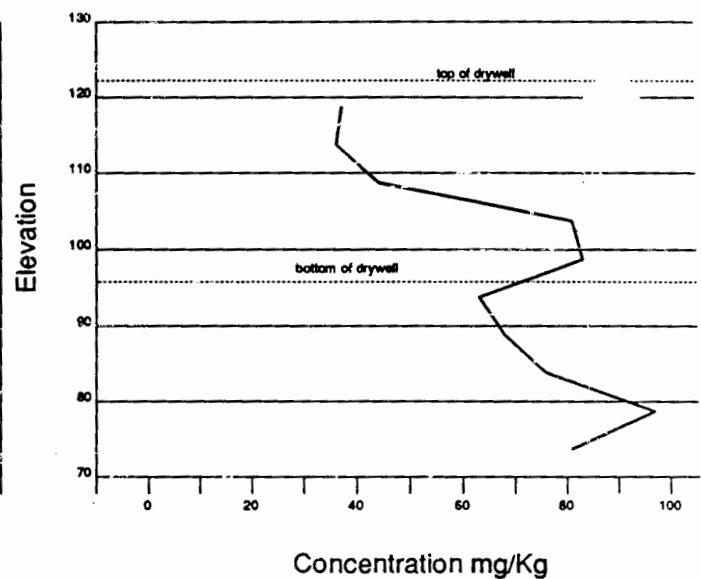
# DRYWELL BORING # 12

0 = Below Detection Limits

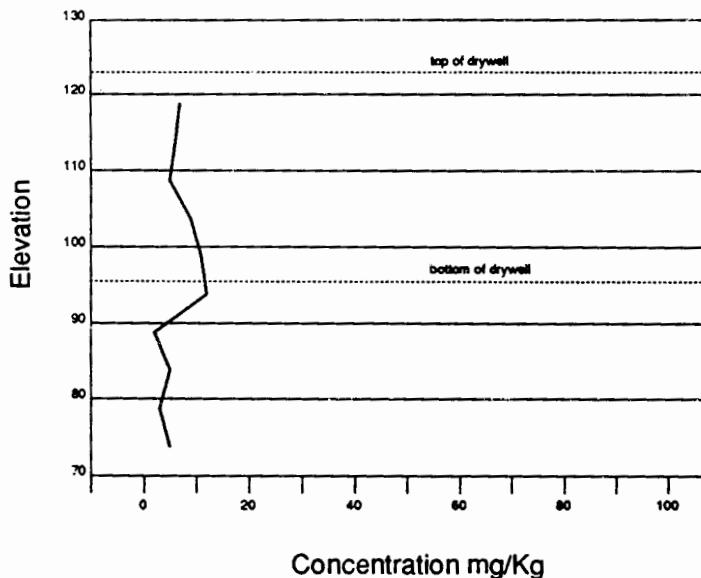
BARIUM



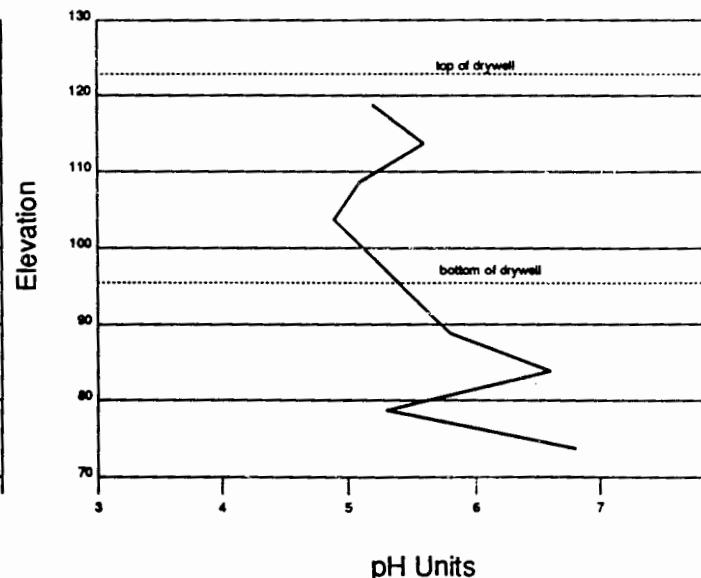
CHROMIUM



LEAD



pH

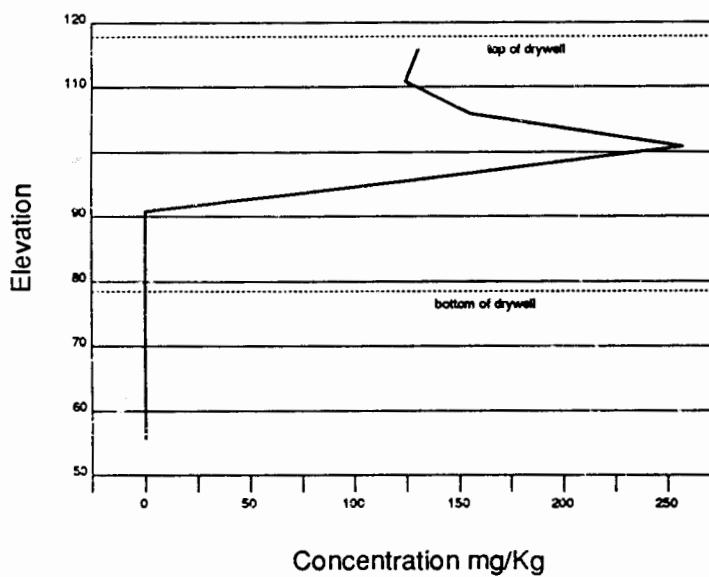


GERAGHTY & MILLER, INC.

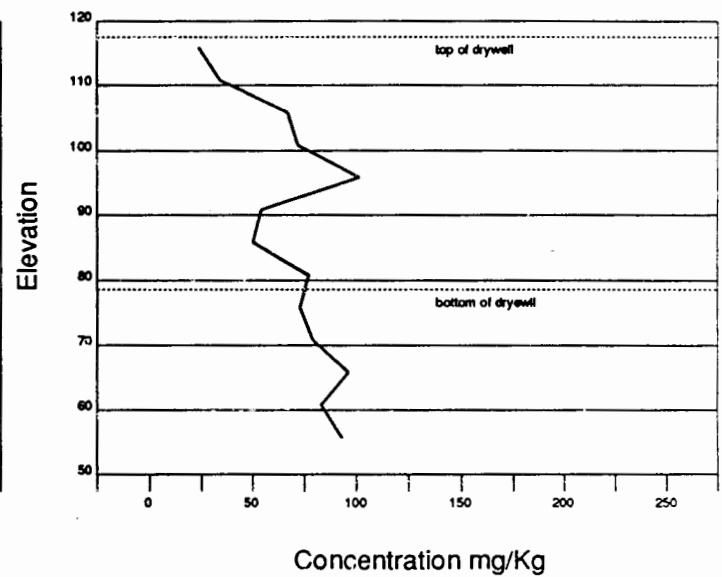
# DRYWELL BORING # 13

0 = Below Detection Limits

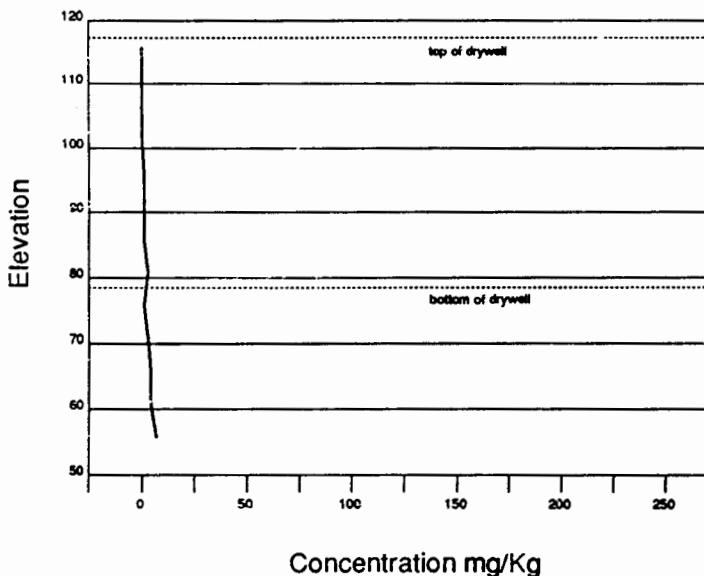
BARIUM



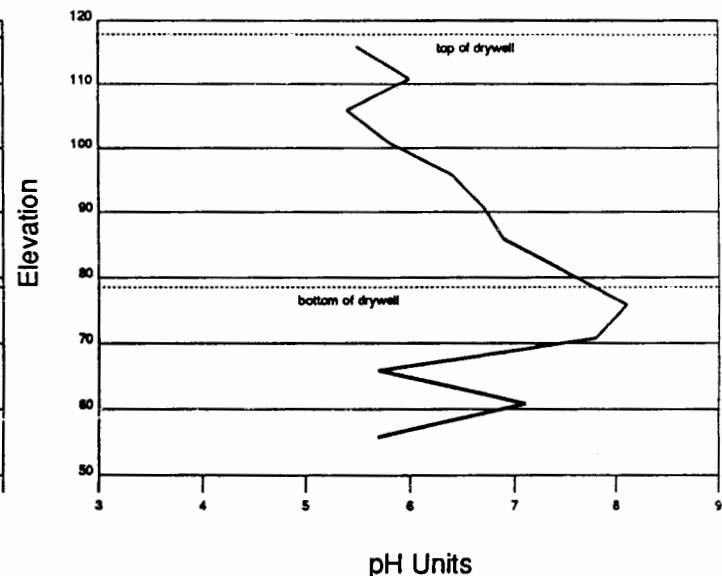
CHROMIUM



LEAD



pH

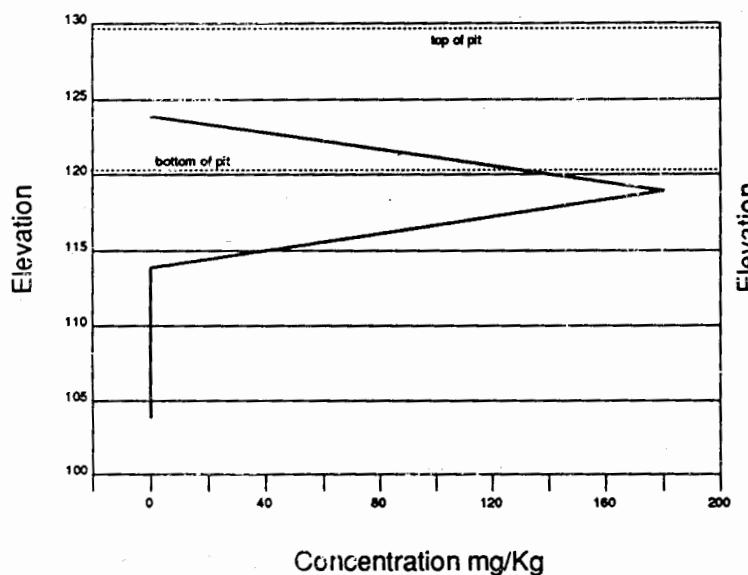


GERAGHTY & MILLER, INC.

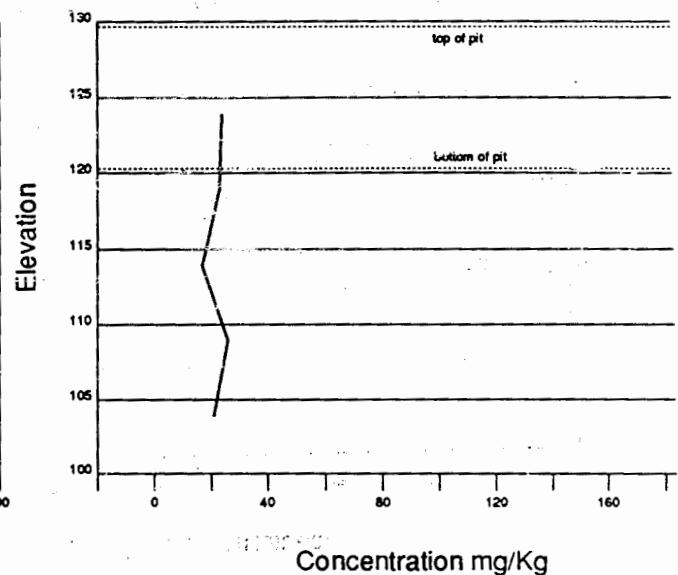
# SEWAGE PUMPING PIT #14, INLET

0 = Below Detection Limits

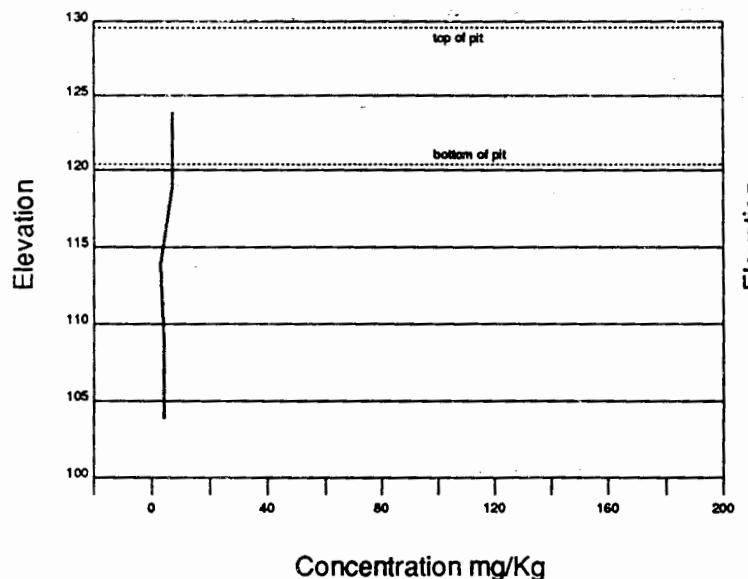
BARIUM



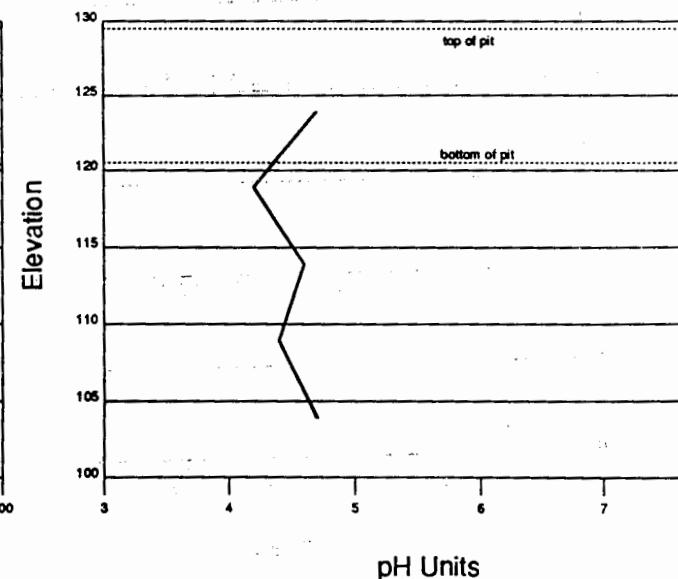
CHROMIUM



LEAD



pH



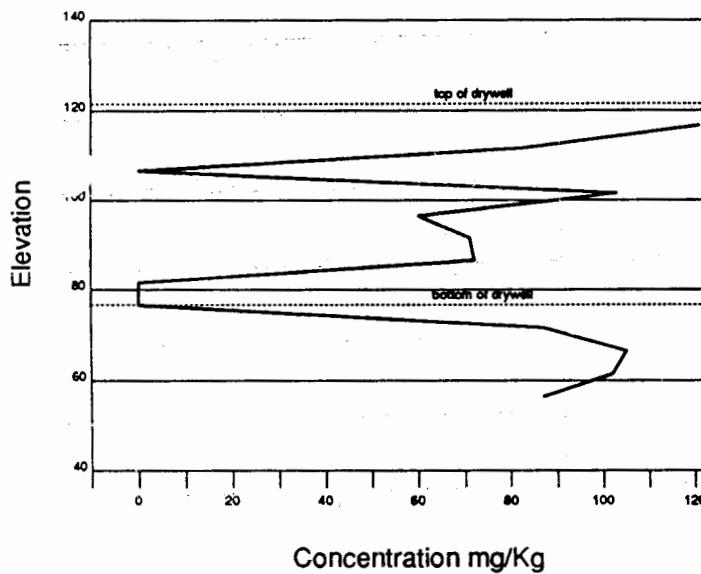
GERAGHTY & MILLER, INC.



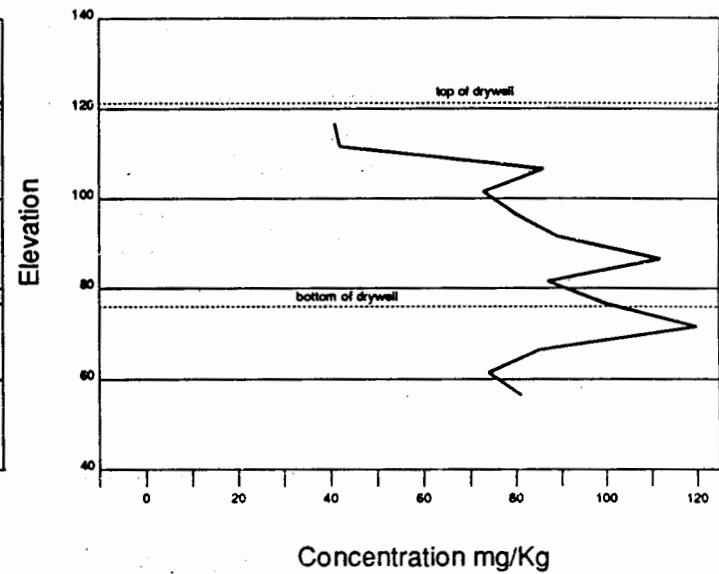
# DRYWELL BORING # 15

0 = Below Detection Limits

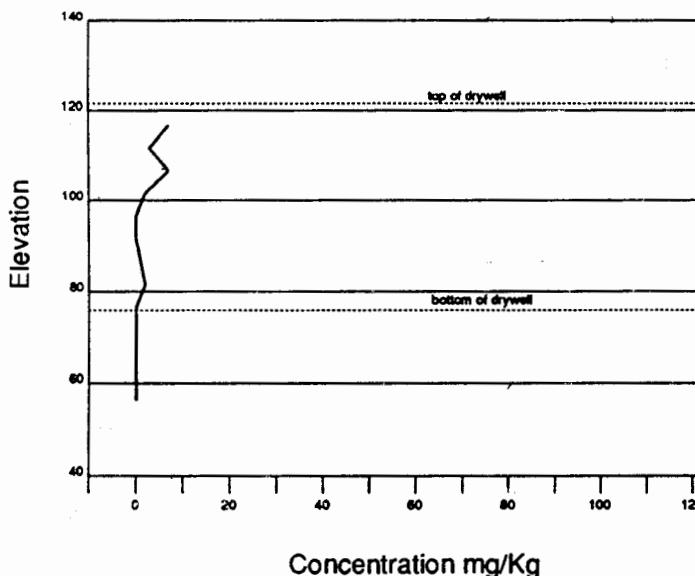
BARIUM



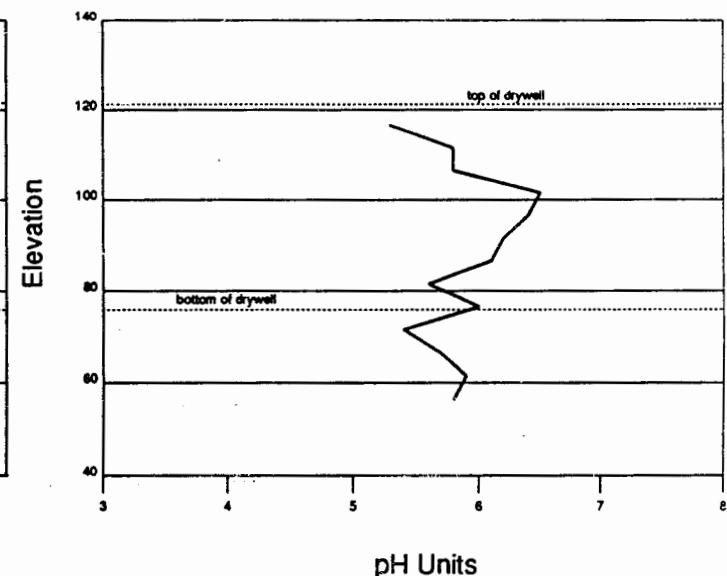
CHROMIUM



LEAD



pH

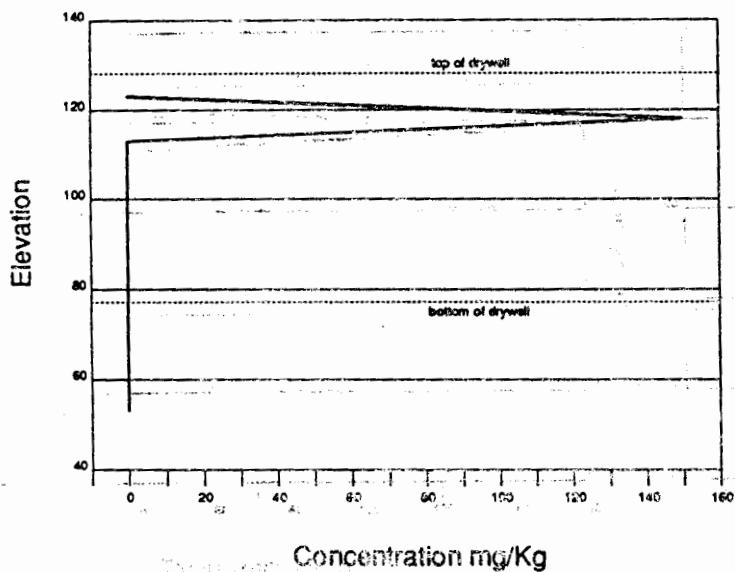


GERAGHTY & MILLER, INC.

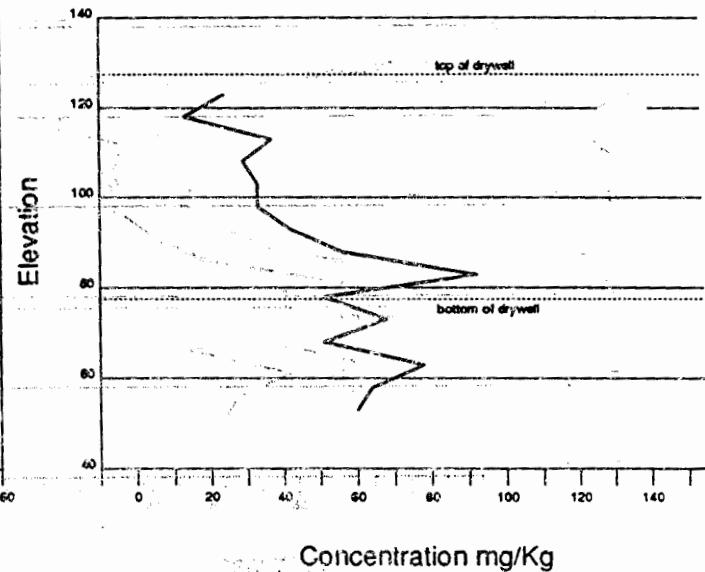
# DRYWELL BORING # 16

0 = Below Detection Limits

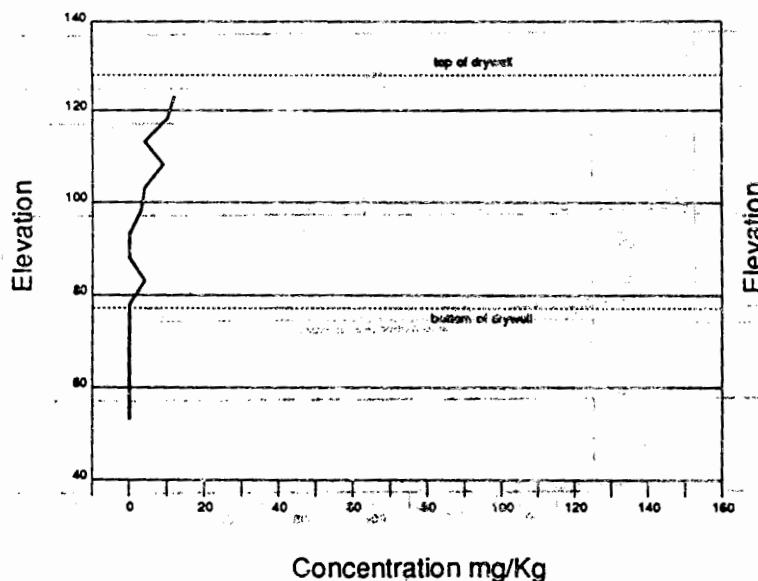
BARIUM



CHROMIUM



LEAD



pH

